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ABSTRACT

A comprehensive statement and presentation of data pertaining to fifteen Iowa health manpower occupations are made for units of State and Federal Government, health and professional organizations, health planners, and lay groups involved in health and other socioeconomic planning activities. The industrialization of Iowa with attendant decline in the importance of agriculture has led to population shifts to the cities, concentrating health services into larger, more economical units. Health professionals and support personnel are also becoming scarce in rural areas but their regional concentration, coupled with improvements in transportation and communication, make possible a wider spectrum of health care than could have been provided in the past. This suggests that policy decisions should be made on the basis of the total functioning of the health industry. (MS)

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Health Manpower Resources: Patterns and Trends

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A Study of Health Manpower in Iowa

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Health Manpower Resources: Patterns and Trends

A Study of Health Manpower in Iowa

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Preface

By Dr. John C. MacQueen

The Comprehensive Health Planning Council—State of Iowa—has been charged with the task of identifying, analyzing, and proposing solutions to the many vexing problems confronting Iowa's health care system. To expedite this assignment in part, the Council created a Standing Committee on Health Manpower. In turn, the latter was given responsibility for studying the state's health manpower markets and institutions.

Recognizing the critical need for a systematic analysis of Iowa's health manpower status, the Committee on Health Manpower initiated research activity which is culminated in this publication. This volume contains a comprehensive statement and presentation of data pertaining to some 15 Iowa health manpower occupations.

It will be invaluable to the committee, and no doubt it will be extensively used by units of the state and federal governments, health and professional organizations, health planners, and lay groups involved in health and other socio-economic planning activities. In addition, this work may serve as the basis for future longitudinal studies in health manpower.

The procedure followed in the development of this volume requires some mention. The Committee on Health Manpower requested that the professional organizations representing each of the health manpower groups furnish relevant information about their membership. This information was then turned over to the Health Economics Research Center at the University of Iowa.

The authors and other members of the Center's staff, using the information collected by the Committee plus reliable data from other sources, performed the tabulations, analyses, and narrative for this book. Special mention is made of the efforts of Dr. Mario F. Bognanno, who had the major responsibility for managing and developing this product.

Further, it should be noted that representatives of each professional organization met with the Committee on Health Manpower and, among other things, were asked to verify the accuracy of the data pertaining to their particular health occupation. The final manuscript was closely edited by Mr. J. R. Gallagher, Director of Communications and Public Information, Iowa Regional Medical Program.

Therefore, this volume represents a major cooperative undertaking involving many professional societies and health organizations; also – the Iowa Office of Comprehensive Health Planning; the Standing Committee on Health Manpower of the Comprehensive Health Planning Council; the Iowa Regional Medical Program and the Health Economics Research Center of the University of Iowa.

Those who participated in collecting these data and developing this document sincerely hope that the spirit of concern and cooperation that prevailed throughout this effort can be continued in unified action aimed at problem-solving.

When the Health Manpower Committee met with representatives of the various professional organizations, it requested airing of any problems they may be having in the areas of recruitment, education, placement, licensure, interprofessional relationships, fees, charges and salaries, continuing education, and the development of aides and assistants. The results of these hearings were impressive and are especially crucial to an understanding of the health manpower problems that exist in Iowa.

The hearing results are not presented here. They will appear later in a related document entitled, "Iowa Health Manpower — Current Operational Problems and Proposed Solutions."

John C. MacQueen, M.D.: Associate Dean for Community Programs and Professor in the Department of Pediatrics, College of Medicine, University of Iowa; Chairman of Standing Committee on Health Manpower of the Comprehensive Health Planning Council—State of Iowa, Iowa Office of Comprehensive Health Planning.

Acknowledgments

A study such as the one here published requires the cooperation and assistance of a great many people. So it is at the recognized risk of overlooking some who equally deserve special credit and sincere thanks that a few from that number are singled out for mention.

Without the encouragement of Dr. John C. MacQueen, Chairman of the Standing Committee on Health Manpower of the Comprehensive Health Planning Council of Iowa, this study would not have been possible. Corresponding recognition should go to Mr. Ben Yarrington, Director of the Office of Comprehensive Health Planning, State Department of Health, who was responsible for arrangements which provided a substantial portion of the funds that permitted this study to be published.

Gratitude goes to Mrs. Sue Cada for assistance in gathering and organizing the data provided by members of the Standing Committee on Health Manpower, by members of professional health organizations and others representing various health occupations—contributors of these data being too numerous to mention individually.

Messrs. Michael Hallerud and Richard Odem assisted extensively in the assembly and tabulation of data in this volume; and Mr. William Smiley produced the charts and maps that helpfully supplement the data. Thanks are due Mrs. Ann MacMillan for typing several drafts of the manuscript in its earlier stages, as they are due Misses Karen Baum and Meredith Cox for additional drafts, including the final version.

Mr. J. R. (Pat) Gallagher, Director of Communications and Public Information for the Iowa Regional Medical Program, performed a small miracle in editing the final draft of the manuscript; and a debt of gratitude is owed to Dr. Harry Weinberg and Mr. Charles Caldwell, IRMP Coordinator and Associate Coordinator respectively, for support provided that was essential to the publication of this study in its finished form.

To all not specifically mentioned but who nevertheless made valuable contributions to the preparation and completion of this study, the thanks of its authors are extended.

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August 4, 1970

INTRODUCTION

Good health is perhaps man's most precious possession. To enjoy sound health personally and to observe loved ones free from illness are among the most strongly rooted of all human desires. This is especially true of Americans, who are neither stoical nor fatalistic toward illness and who regard health as a "right and not a privilege." Consequently, few topics of discussion are more emotionally charged than those involving matters of health.

It is not surprising, then, that concern for the nation's health care delivery system and its ability to render an adequate level of services to the population has today reached a level higher than at any time previous in our history. The current period is witnessing what could well be regarded as some of the most dramatic changes in the entire history of America's health care delivery system.

In an age when medical discoveries have produced cures for diseases long thought to be incurable, have permitted the alleviation of physical pain and suffering once thought inevitable, and indeed made possible the literal replacement of parts of the human body, America is considered to be in a state of crisis concerning matters of health.

National apprehension has been expressed concerning rapidly rising costs of health services. It has been predicted that hospital costs may reach one thousand dollars a day in the not so distant future. There is increasing realization that due to existing inequities certain subgroups of the population have access to hardly minimal health care. Concern is prevalent that the quality of medical care is declining due to the enormous demands placed on existing medical manpower and facilities by an increasingly affluent and health-conscious public.

Numerous national commissions have forecast critical shortages of health manpower in the future. It is only expectable that responsible persons in the State of Iowa should share the current concern and undertake the work and effort necessary to assess Iowa health manpower and facilities in the interest of determining (1) their level and (2) whether or not they are providing a flow of health services adequate for Iowa citizens now and will continue to do so in the future.

Industrialization and Urbanization

Iowa, like many other midwestern states, is undergoing transformation from a predominantly agricultural state to one of balanced economy —maintaining a strong commitment to agriculture, but rapidly becoming industrialized as well. This transformation is illustrated by data that demonstrates the shift from agricultural to nonagricultural employment in Iowa.

Table 1 presents Iowa employment data for selected years over the time period 1950 to 1965. It shows that the percentage of the labor force employed in agriculture was 27.8 percent in 1950. By 1965, the last year for which such data are available, only 16.4 percent of Iowa's labor force was employed in agriculture.

Table 1. Agricultural and Nonagricultural Employment as a Percent of Total Employment for Iowa: 1950-65[a]

	Total Employed		Agriculture		Non-Agriculture	
(x1000)	No.	Percent	No.	Percent	No.	Percent
1950	1,011.9	100.0	281.3	27.8	730.6	72.2
1955	996.8	100.0	241.6	24.2	755.2	75.8
1960	1,023.8	100.0	206.9	20.2	816.9	79.8
1965	1,085.0	100.0	177.6	16.4	907.4	83.6

[a] Bureau of Business and Economics Research, *Economic and Statistical Review of Iowa, 1950-65*, College of Business Administration, University of Iowa.

This diversion in economic activity by substantial numbers of Iowans is associated with other changes of great significance that have bearing on the character of the state. Since people normally prefer to live near the place where they work, the increasing reliance on nonagricultural employment has been accompanied by rather dramatic migration of rural population to Iowa's cities and towns that are centers of nonagricultural economic activity.

The downward trend in rural population has been in progress throughout the United States since the turn of the century. Among midwestern states experiencing similar rural-to-urban population shifts, Iowa's rural migration has been particularly extensive because this state in the past has been more highly agricultural than a large part of the nation.

Table 2 shows the percent of population living in "urban areas" (as defined by the Bureau of the Census, consisting of communities of 2,500 or more population) for Iowa, the nation, and six adjoining states in the years 1950 and 1960.

It shows that in 1950 Iowa's population was substantially less urban than the nation's and than the average of the six surrounding states.

Iowa's percent of urban population increased by 5.3 percentage points (47.7 to 53.0) between 1950 and 1960. Corresponding urban population gains for the nation and the six states bordering Iowa were respectively 5.9 (64.0 to 69.9) and 5.2 (64.8 to 70.0).

The important factor in evaluating these comparable increases in urban population is the base provided by the 1950 urban population in each case. Iowa's gain of 5.3 percentage points constituted an 11.1 percent increase over the 1950 figure of 47.7. The national rise by 5.9 over the 1950 base of 64.0 represented a 9.2 percent increase; and the border-states' average rise of 5.2 over 64.8 was only an 8.0 percent gain.

The process of urbanization transpiring in Iowa presents many problems. An especially serious one is the congestion of urban areas that is producing increased demands for municipal services (sanitation, police and fire protection, recreational facilities, etc.). In rural areas, the problem is one of reduced availability of certain services due to a scarcity of people to support existing private and public facilities that supply those services. It is not economically feasible to support certain services, lacking a critical mass of people to utilize them and to support their production at reasonable per-unit cost.

Highly trained professionals, particularly health professionals, are among the most mobile components of the labor force. As communities suffer population declines or for other reasons cease to expand the quantity and quality of services desirable, those capable of contributing most to the community tend to leave. The result is a further loss of available services and a further loss of population thus prompting further deterioration of services available.

This chain of events is particularly true of health services. The presence of a physician in a community is often viewed as the minimum of health service availability that most residents want to accept. Once the community is without the services of a physician, other residents who have valuable skills tend to leave. Those remaining are usually the least skilled and the least mobile; but they need and desire services —including health services—in quantity and quality no longer available.

Many Iowa communities are caught up in this vicious circle that entails steady deterioration of necessary services. As they lose population, these communities find themselves also losing services or lacking sufficient revenue to cover the high-unit costs of facilities capable of producing needed services. This is true of many services—e.g., educational, commercial, and public safety—in addition to health services.

Table 2. Percent Urban[a] in United States Iowa, and Six Adjoining States: 1950 and 1960[b]

	1950	1960
United States	64.0	69.9
Iowa	47.7	53.0
Six State (avg.)	64.8	70.0
Illinois	77.6	80.7
Minnesota	54.5	62.2
Missouri	61.5	66.6
Nebraska	46.9	54.3
South Dakota	33.2	39.3
Wisconsin	57.9	63.8

[a] Current definition of "urban" used for 1950 and 1960.

[b] U.S. Bureau of the Census, *Statistical Abstract of the United States: 1962.*

Because of the pervasive nature of the forces leading to urbanization and industrialization, the concentration of essential services in urban areas and their reduced availability of services where population is declining must be expected. It is within this framework that the health services industry should be viewed.

Purpose of the Study

The purpose of this study is to survey the types, characteristics and location of Iowa's health manpower resources in order to provide basic information on which to formulate health manpower policies for the State of Iowa. Factors presently influencing and-or applying pressures on Iowa's health care delivery system to make adjustments required by changing demands include:

The rapid rate of growth of the health services industry; the growth of private health insurance; the recent adoption of Medicare and Medicaid; the implementation of various new medical programs (e.g., the Iowa Regional Medical Program); as well as the economic factors sketched above that underlie the rapid migration of population from rural to urban areas within the state.

The system unquestionably has responded in some degree to changes in demand prompted by the factors mentioned; but whether or not it can adjust rapidly enough to accommodate future needs of Iowa citizens is subject to legitimate doubt. This poses the question of how best to bring about required adjustments smoothly and effectively without disrupting the system itself. This is an extremely important consideration that involves preservation of the integrity, freedom and other virtues possessed by the health care delivery system that has so admirably served Iowans in the past.

The smooth transition of this system to one capable of meeting the health needs of Iowans in the future requires a great deal of planning. Since the forces prompting change are broad in nature, they affect the system as a whole; and planning, consequently, must be comprehensive in nature. Yet it must be responsive to both the general health needs and to the unique features of local communities throughout the state.

A necessary step in comprehensive health planning is the gathering of facts and information characterizing the current state of the health care delivery system. The primary objective of this volume is to present facts concerning Iowa health manpower in a perspective useful for their interpretation. While data are presented and are interpreted in this volume, no attempt is made to draw policy conclusions or to make recommendations concerning what should or should not be done now or in the future.

Economists and other social scientists have some advantage in their expertise in manipulating, analyzing and interpreting data, but additional responsibility for formulating health policies must necessarily lie with the suppliers of health services; and ultimately, responsibility lies with all people who may be expected to benefit from receiving those services.

Purpose of Introductory Chapter

Subsequent chapters are devoted to the presentation and interpretation of data pertaining to 15 occupational categories of health manpower in Iowa. These chapters are complete and are self-contained in the sense that the information available is carefully described and limitations in the data are fully exposed.

A primary objective of this chapter is to enhance the reader's understanding of the material presented in subsequent chapters by sketching the analytical perspective that guided the study. It is hoped that knowledge of this analytical perspective will assist policy-makers in arriving at policy decisions that will best serve the interests of Iowa citizens. The chapter also presents a section briefly describing the methodology followed in the study and discussing its limitations. A final section presents a brief overview and summary of the study's findings.

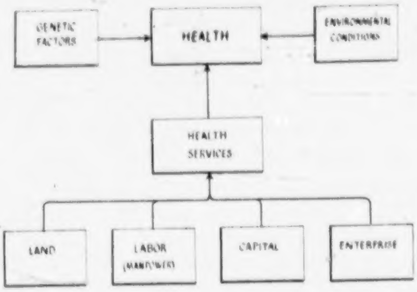
ANALYTICAL FERSPECTIVE

An industry is a group of production units (firms) producing a similar output, product or service. It may be legitimately asked: what is the output, product or service produced within health facilities, office practices, and other production units making up the health services industry?

The principal output of the system might, perhaps, be identified simply as "health". After all, is it not the ultimate objective of the efforts of health professionals and others actively engaged in health care delivery to improve the health status of all individuals entering the system? Health surely must be regarded as the major "benefit" society gains from the existence of the health service industry.

However, to call "health" the primary output of the health services industry would be in error. In doing so, too much responsibility is imposed on the health services industry—for health is a resultant of a number of factors beyond the control of the industry's various components. The top line of Figure 1 suggests two other broad categories of variables, "genetic factors" and "environmental conditions," that exert great influence on the health status of individuals (there may be others).

Figure 1
The Relationship Between Health Services and Health



Physicians, dentists, nurses, etc., can hardly be held responsible for the vulnerability to certain illnesses which is imparted to individuals at birth; or for the extent to which the pollution of our atmosphere and drinking water has impaired the ability to function—and will continue to do so in the future.

It should also be noted that the output of most industries is not measured in terms of the major benefits rendered to society. For example, the output of automobile industry is not measured in terms of happy motoring miles, but rather in terms of the number of cars produced over some time period, usually a year.

Finally, to say that the output of the health services industry is "health" would imply denial that this output is a valid product in the case of individuals examined and found healthy and in cases where medical treatment is unsuccessful. Yet considerable resources are expended in these instances, and adherence to the notion that health is the primary output of the industry would under such circumstances incorrectly suggest that these resources were wasted.

One must distinguish between benefit and output. As Figure 1 suggests, the output of the health services industry is *health services;* and it could be appropriately regarded that the principal benefit of receiving these services is "health" a state that is the resultant of other factors in addition to the receipt of health services.

Health Services

To clarify thought, the concept of health services should be further refined. Following Fuchs, health services may be broken down conceptually into the following components:[1] (1) medical services, (2) validation services, and (3) other consumer health services. "Medical services" are diagnostic (positive), therapeutic, rehabilitative, preventive, etc., services that are directly rendered to patients by health professionals. "Validation services" are also services rendered directly to patients by health professionals but consisting primarily of services that reaffirm an *a priori* conjecture that a person is healthy. Life insurance examinations, flight physicals for pilots, and pre-employment examinations are good examples.

"Other consumer health services" consist of supplementary or supporting services that in many cases are necessary to or complementary with the rendering of medical and validation services. The "hotel" services provided by hospitals and nursing homes are good examples.

Last year, Americans spent over $60 billion on health services. Well over a third of these funds were spent on institutional care provided in hospitals and nursing homes. The category of "other consumer health services" is not trivial; one might wonder how much of the recent rise in medical costs stems from increases in the costs of rendering these services as compared to services rendered directly to patients by health professionals.

Unfortunately, statistical data are lacking that would permit breaking health services down into the three categories discussed above. It is important, nevertheless, to recognize that the output of health services is a composite bundle of services, some of which are more directly related to improving health than others.

The Production of Health Services

In economic terms, the production of goods or services is accomplished by the entrepreneur-managed interaction of production factors, the latter usually labeled broadly as land, labor, capital and enterprise. In most of the private sector of the economy, enterprise is treated as a factor of production based on the assumption that production is conducted for the purpose of earning a profit and that the entrepreneur assumes all financial risks for the success or failure of the enterprise.

It is not clear in all cases that enterprise is a productive factor in the health industry, since a large part of the health services industry is not profit-seeking. Certainly there exist fewer profit-maximizing or risk-taking entrepreneurs in this industry than in the rest of the private economy. (The managerial function is subsumed under the latter category, being an administrative or overseeing kind of activity as opposed to risk-taking—which is the function of entrepreneurs.)

Clearly, pharmaceutical firms are profit oriented, as are proprietary nursing homes and hospitals. With physicians and dentists, the case is less clear. Some would dispute that physicians and dentists do not operate as entrepreneurs. They would argue that physicians and dentists attempt to maximize the profits of their practices and therefore do assume the financial risks of the success or failure of the firm, be it a solo or a group practice.

An even harsher view is that physician and dentists practice price discrimination, charging rich patients dearly, and poor patients less for the same service. (In this view physicians and dentists are modern day Robin Hoods.) A more moderate view is that physicians are much more eleemosynary in their pricing policies than the above accusation would suggest, that fee schedules are flexible downward only, and that no patient is refused service simply because he is unable to pay the "customary or usual fee."

It is not important here to take a position on whether or not physicians and dentists are price discriminators, or even whether or not they are entrepreneurs. It is important, however, to recognize that the production of health services—like the production of all other goods and services having economic value—requires the combining of resources of different kinds (at least manpower, land and capital) into the service that is produced. Physicians, with all their technical knowledge, can do very little without offices, hospitals, equipment, assistants and intermediate products such as drugs and dressings.

Given quality of service, it only makes good sense that whoever is responsible for the management of a production unit (be it an office practice or some other service facility) should maximize output of service with given resource inputs; or—to simplify—that services should be produced at the lowest reasonable cost of inputs.

This is done by judiciously combining inputs, taking into account the relative values of the time of health professionals and other elements of health manpower and also the prices of other input factors, as well as taking their respective productivities into account.

Variations in technology, in prices of inputs and their productivities, should lead to varied combinations of inputs being utilized. For example, when a shortage of practicing physicians becomes evident it should be expectable that capital equipment would—up to a point—be substituted for certain procedures that call heavily on physician-time. Ancillary personnel would be trained to relieve the physician of routine tasks, reducing the input of physician-time spent per procedure and correspondingly increasing the proportion of non-physician effort expended.

However, it should be noted that the extent to which various inputs are flexible in terms of function and divisibility (the extent to which input services can be acceptably partitioned or divided up for use) determines which inputs may be substituted for each other and to what degree. For example there are functional limits imposed by law, education, etc., governing the degree to which nurses may substitute for doctors. Moreover, factor inputs are only limitedly divisible. A physician may at a given moment find that he has need for one and one-half medical assistants—but medical assistants are available in whole units only, and may not be partitioned.

Economists sometimes refer to this indivisibility of factor inputs as "lumpiness of resources". This underscores that, to a certain degree, factor inputs are available and may be used only in discrete units such as the example of medical assistants suggests.

Economies of Scale and Location

A physician who needs only one and one-half medical assistants to serve his patients, but who is forced to hire two in the interest of providing high quality care to his patients, is through no fault of his own operating the practice at less than optimal efficiency. The equivalent of one-half of one medical assistant is excessive to his need, hence the practice is operating with unutilized capacity.

However if the practice were doubled in size —the number of patients seen were doubled, and a physician-partner were added to the practice—then if the optimal combination of medical personnel is one and one-half medical assistants per physician, the practice could operate at maximum efficiency with only one additional medical assistant being hired for sharing between the partners. Other things equal, per unit costs per procedure would be lower in the second case than in the first.

The phenomenon of decreasing per unit cost as scale of operation enlarges is often referred to as cost economy accompanying economies of large scale production. Available statistical evidence suggests that substantial cost economies are possible when hospitals and physician practices operate on larger scales of production.

However, building large production units in order to take advantage of resulting cost economies limits consumer accessibility to health services. As is true of many personal services, the production and distribution of health services occur at the same point in time and space. Few health services are easily transmittable. This means that consumers must present themselves at the point of production to benefit from services.

Accessibility to health services depends significantly on the location of production facilities —physician offices, hospitals, etc. Therefore, limiting the number of production facilities to a few large scale units simultaneously limits consumer accessibility to health services. For if travel costs of patients and staff personnel (including out-of-pocket costs plus the value of time spent travelling) are included in per-unit cost calculations along with actual production costs, the optimum size of production units would necessarily be smaller than if travel costs were ignored.[2]

Supply of Health Services

The supply of health services available depends on production technology, on the quantity and productivity of factor inputs, on prices of factor inputs, the efficiency with which production is organized, and on the prices at which health services may be sold. In most cases, the supply of health services is relatively greater as the prices of the various services produced and sold become higher.

Higher prices for services sold allows the payment of higher prices (wages, rents, etc.) for factor inputs, including the wage or profit accruing to those managing the firm. It is possible that cost economies may permit an increased supply of services to be offered at lower prices up to a point. But eventually such cost economies are likely to be overcome by rising factor prices, scarcity of key inputs, and various sorts of managerial inefficiency that result from large and therefore unwieldy organizational structures associated with large scale enterprise.

The existence of health inputs organized in a manner to supply health services efficiently doesn't necessarily insure that health services will be consumed in desired quantities—even if substantial need for them exists. The demand for health services correlated with the supply of services available determines the rate at which services are utilized or consumed.

Need vs. Demand

Considerable confusion has been evident in health economics literature as to the distinction between need and demand. The two concepts are quite distinct.[3]

"Need" is a term usually used by health professionals. Taken literally, the term usually implies (assuming availability of adequate medical technology) the absence of "perfect health"; or alternatively, the presence of various illnesses in a given population that are amenable to medical treatment.

Health needs of a given population depend on hereditary and environmental factors as well as on such factors as life style, standards of living, and others.

More subtly interpreted, the term "need" takes for granted the presence of a certain quantity of medical services that a given population ought to consume in order to achieve the maximum state of health permitted by the current capacity of modern medicine to treat illness. The key word in the sentence immediately above is "ought", which conveys the connotation of a normative judgment. It is entirely appropriate that health professionals make normative judgments concerning what quantity and quality of health services the population *should* consume. Moreover, it is appropriate that such judgments be independent of prices, income and other economic factors.

However, the ultimate answer as to what quantities of health services consumers will want to consume is quite different and is best couched in economic terms. There are several reasons why the quantity of health services that consumers want to consume may be quite different from the quantity of services that health professionals feel *need* and *ought* to be consumed. Among them are the following:

(1) Due to ignorance, consumers' perceptions of their needs for health services may be much different from what highly trained health professionals view those needs to be.

(2) Cultural, religious, educational and social status factors influence consumers' wants for medical services *vis a vis* other things.

(3) Price, income and other factors influence consumer demand for health services as opposed to other things.

The demand for medical services, or for that matter the demand for any goods or services, arises out of consumers attempting to satisfy psychologically formulated wants that in large part depend on their perceived needs for things. Wants serve as the basis for the formulation of consumer tastes and preferences for goods and services. Economists traditionally assume wants, and consequently consumer tastes and preferences, as "given" and then proceed to explore the market consequences of any given set of tastes and preferences.

To satisfy wants, consumers enter the marketplace seeking to exchange money for those goods and services that are desired. However, since most consumers possess limited financial resources and the goods and services they desire have positive prices, they cannot buy all the goods and services in the quantities they desire. It is assumed that consumers are rational and judiciously allocate available financial resources among alternative goods and services, purchasing that combination which yields the maximum satisfaction attainable, limited by their financial resources and the prices of goods and services in the marketplace.

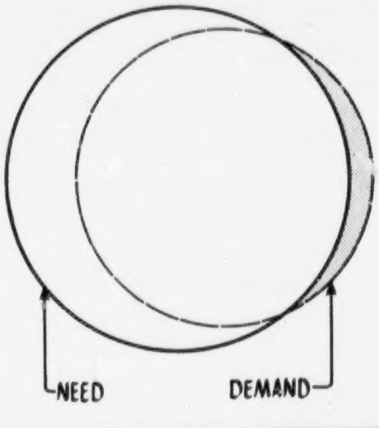
Therefore, the quantity of health services demanded by a given population of health consumers depends on collective consumer wants (which, in turn, depend on perceived needs) for all goods and services; also upon prices of health services, the prices of alternative goods and services, the size of the population, and the financial resources available to its members.

If consumers were totally aware of their health needs, would they buy the quantity of health services they need? In most cases, probably not, for the reason that most consumers—given limited purchasing power—*cannot* purchase all desired quantities of the *goods and services* they need and want. Consumers are likely to be aware of standards of need for food, clothing, shelter and recreation, as well as those pertaining to health care. Since the collective financial resources of the population's members do not permit them to buy goods and services in the quantities necessary to satisfy all their wants, they are likely, in the aggregate, to strike some sort of compromise and consume less than wanted quantities of all goods and services, including health services.

However as prices of health services become lower relative to other goods and services, consumers with given limited financial resources may be expected to buy more health services and fewer of other things—and then consumption of health services will more nearly approach need.

The relationship between demand and need is depicted in Figure 2. It shows need exceeding demand for reasons already discussed above. The shaded area on the right hand side of Figure 2 represents the demand for unneeded health services exercised by hypochondriacs, overly health-conscious individuals, etc.

Figure 2
The Relationship Between Demand and Need



Interaction between the demand for and supply of health services determines the quantities of health services that are utilized or consumed and also determines the price of health services in the market place. Need influences demand only to the extent that needs are preceived by consumers and influence consumers' wants for health services as compared to other things.

On one hand, increased perception of consumer needs—supplemented by financial resources, the prices of other goods, and interest in health services as compared to other things—serves to increase consumer demand for health.

On the other hand, increases in the productivity of health inputs (including health manpower, capital, etc.), along with decreases in their prices, improvements in technology and the efficiency with which production is organized, all tend to increase the supply of health services available.

Summary of Analytical Perspective

The ultimate goal of the health services industry is to improve the health of the population. However, improved health is the resultant of many factors besides the health services produced by the health services industry.

To produce health services, manpower, land, capital—and, in some cases, enterpreneur resources—are combined, hopefully, in an optimal fashion to produce high quality services at minimum cost. No single resource can be credited with supplying the whole complement of medical and other consumer services comprising the output of the health services industry.

One aspect of the health services industry that bears consideration is that significant segments of the industry are not profit oriented.[4] Eleemosynary, charitable and benevolent motives underlie the allocation of a large portion of the resources utilized by the industry. In such instances, the supply of services does not reflect a response to market forces.

In many cases, facilities are constructed and production is organized for the purpose of supplying the needs for health services of relevant populations of consumers. Yet the coincidence of supply and need will not determine the rate at which health services are utilized or consumed.

The rate of utilization or consumption of health services depends on the interaction of supply with demand. The latter is but partially dependent on the need for health services—only to the extent that such needs are perceived—and also depends on other factors such as financial capacity to acquire consumer goods and services, the prices of health services, the prices of consumption alternatives, and tastes and preferences (wants) for things other than health services.

The ultimate question that this study and others like it should be attempting to answer is the following: Is the existing and will the future supply of health services available to Iowans be sufficient to meet the demand for them at reasonable prices?

Unfortunately the complex nature of the output of the health services industry, the paucity of available data that deals with the consumption of health services by consumers, and the urgency with which policies must be formulated preclude attempts to address directly the question posed above. It is possible that such a question could never be answered definitely, even given a more substantial period of time than Iowa citizens can afford.

So this study, like many others, attempts only to answer the ultimate question partially and in a rather indirect way. Rather than focusing on the supply of health services currently available, this study focuses on the current availability of a key resource—health manpower—that is essential to the production of health services.

There is no question concerning the importance of health manpower in the delivery of health services. It has been estimated that nearly two-thirds of the total value of health services may be attributed to labor input. Thus, a considerable amount of light may be shed on questions concerning the available supply of health services by looking at the quantity and characteristics of the labor resources available, along with other inputs needed to produce them.

METHODOLOGY OF THE STUDY

The purpose of this section is to acquaint the reader with the methodology employed in subsequent chapters. An effort will be made to reveal the broad limitations of the data available for purposes of this study, as well as the limitations inherent in the way in which the data are analyzed.

Data Available for Study

Data were available for purposes of this study from three major sources: licensure records, the records maintained by professional organizations and occupational associations, and data collected in the course of special research projects conducted by the Health Economics Research Center, The University of Iowa.

Since data were obtained from a wide variety of sources, it was impossible to achieve uniformity in terms of the variables on which observations are based or uniformity as to the time periods upon which observations are made. In those health manpower categories that do not require state licenses, the only source of employment location data was the membership (name and address) rosters maintained by relevant occupational associations.

In cases where few members of a particular occupational category were affiliated with their occupational association, ratios of population to category members are extremely misleading and should be interpreted with particular care. In all cases, the data analyzed in the course of this study were examined for authenticity and accuracy by appropriate health professionals who were not members of the staff of the Health Economics Research Center.

Ratio Analysis

The traditional approach to measuring the "adequacy" of various categories of health manpower in a given geographical area is to calculate the ratio of population-to-be-served to the number of members of an occupational category (e.g., ratio of population per physician) and compare the result with some standard ratio that informed medical opinion judges to be "adequate".

While numerous ratios of population to various categories of Iowa health manpower were calculated in this study, these ratios were determined for descriptive, and not prescriptive, purposes only. In some cases, ratios were compared with those of the nation as a whole. In other cases the data permitted substantial comparisons of corresponding ratios over a period of time. These ratios should be interpreted cautiously.

It is tempting to compare ratios of population to particular categories of health manpower with some standard ratio—one pertaining to a region of the country where medical care is judged to be excellent, or a ratio attained in the past when medical care was at a high level. In effect, these approaches implicitly view ratios of population to categories of health manpower as indices of the demand and supply for health services.

As Frank Dickerson, former director of the Bureau of Medical Economics of the American Medical Association, commented on population to physician ratios, "The population-physician ratio . . . reminds one of attempts to measure supply and demand by counting buyers and sellers."[5]

As earlier explained in the section on Analytical Perspective, interest should center principally on the supply of health services available and the demand for these services on the part of the population needing them. Population to health manpower ratios are suitable indices of demand and supply relationships only if two assumptions hold: first, that the demand for health services is directly proportional to population; second, that the supply of health services available is directly proportional to the number of members in particular categories of health manpower.

It is extremely unlikely that either of the above assumptions hold. The demand for health services depends on financial resources, the prices of health services, the prices of other goods and services, social-demographic factors (age, sex, etc.) and consumer wants (influenced by needs) for all things including medical services. In addion, the supply of health services depends on how production is organized, the extent to which capital is used to support or to substitute for labor resources, the costs of inputs, and the final output of health services and technology.

Admittedly, it is almost impossible for anyone to take into systematic account, by formula or otherwise, the factors that—in addition to population and the quantities of health manpower—influence the demand for and supply of health services. So policy-makers and others who have use for the ratios presented in this volume should be aware of the limitations of ratio analysis and attempt, even if only subjectively, to take the other factors mentioned above into account.

Data do not interpret themselves and judgment is the ultimate step in the process of decision making. In this connection and in the interest of conveying the intended spirit of this discussion of the limitations intrinsic in the methodology used, the following statement is offered:[6]

> In recent decades a number of national studies have been undertaken to assess physician "requirements" in the United States. Their methodologies and their estimates of the "shortage" have differed. Thus, their recommendations, therefore, have also differed.
>
> Many of these studies have been subject to the criticism that they have set manpower goals without sufficient analysis of the costs and benefits of achieving these goals and of possible alternative ways of reaching the health or medical service goals implicitly adopted, though seldom explicitly stated. It has never been clear, however, that the critic's framework and methodology, however sophisticated and rigorous, could be applied to the data then available.
>
> Public policy was forced either to rely on those statistics that could be gathered, on observation and judgment, or to "do nothing." Doing nothing, however, is a positive act: a rejection of the data and the judgments, the adoption of a wait and see policy. It is, therefore, not surprising that, given the importance of health, physicians' services and physicians, national bodies preferred to serve the policy maker by relying on their approach supplemented by judgment rather than waiting for the "best" data and thus saying nothing.
>
> This is not an argument for bad research rather than no research, bad methodology rather than no methodology, bad advice rather than no advice. Rather, it is a recognition that criticism of methodology or research is of little immediate assistance to the policy maker unless a better methodology is available *and can be utilized.*
>
> In the case of the "physician shortage" the criticism has often taken the form "you haven't proven the case. We can't be certain." While often this has been true, the policy maker is still confronted with a decision. He must conclude whether or not there is a shortage, and cannot wait until the case has been proven. For if he waits till the case is proven, he has in effect decided to act as if there is no shortage.
>
> The role of the critic is an important one. He helps set standards. Without him it is doubtful that the quality of studies would improve as rapidly. He helps force the collection of better data, the improvement of analytical techniques.
>
> It should be recognized, however, that the role of the policy maker is different

from that of the critic. He must weigh the costs of action and inaction. The argument "you have not proven that a shortage exists" is different from "there is no shortage." The policy maker does, and should, treat them differently. He is also aware that, no matter how refined the statistics, judgment will still be an important ingredient in any analysis.

COMPARISON OF SELECTED HEALTH CARE INDICES: UNITED STATES, IOWA, ADJOINING STATES

No single index can outline the state of affairs of health manpower in Iowa or any other state. Consequently, in the interest of perspective, this section focuses on certain professions critical to the production of health services and compares Iowa's position relative to the United States' and the six midwestern states' that adjoin Iowa. Additionally, to get some rough approximation of the fixed resources available for use in combination with the above manpower, this section also presents a comparison of Iowa hospital bed capacity with that of the nation and of surrounding states in selected years.

Physicians

The population to physician (M.D. and D.O.) ratio has been declining nationally, as shown in Table 1. Since 1960, the population-per-physician ratio for the United States has declined more than nine percent, from 750 persons in 1960 to 681 in 1967. This apparent improvement in supply of physician manpower was not equally distributed throughout the nation, however.

The aggregate ratio for the states adjacent to Iowa declined only seven percent during 1960-67. Table 1 shows Iowa lost ground during the interval, relative to surrounding states; the Iowa ratio declined by approximately three percent. Between 1965 and 1967, the absolute number of physicians in Iowa actually declined, raising the population-per-physician ratio from 837 in 1965 to 841 in 1967.

A steady gain in the actual number of physicians was exhibited during 1960-67 by the United States and Iowa's six neighboring states. The corresponding population-per-physician ratios also declined steadily over this period except, as noted, in Iowa—and in Minnesota during 1965-67. However, Minnesota's rise in population-per-physician ratio resulted from a population increase that proportionately exceeded an increase in the number of physicians—not from a loss in the absolute number of physicians, as was the case in Iowa.

Although Iowa's population-per-physician ratio has trailed the average of surrounding states, in 1960 and 1965 its ratio was the median ratio of the seven midwestern states. But by 1967 its ratio had dropped to sixth place among the seven, only South Dakota having one higher. Moreover, Iowa's ratio is not improving, whereas those of the United States and the neighboring states (excepting Minnesota) have been, as noted in Table 1.

Dentists

The number of dentists in the United States has been steadily rising during the interval 1960-68, but the average number of patients each dentist must care for—as measured by the population-per-dentist ratio—has behaved erratically. The population per non-federal dentist ratio for the United States from 1960 through 1965, as presented in Table 2, rose almost five percent. Although this development was dramatically reversed between 1965 and 1968, the net change in the population-to-dentist ratio over the entire period represented an increase of only one-half of one percent.

The aggregate ratio of population to dentists for the six states adjoining Iowa increased nearly six percent over the period 1960-68. Iowa's

Table 1. Population per Physician (M.D. and D.O.) for Iowa, United States and Adjacent States: Selected Years

	1960		1965		1967	
	Number[a]	Ratio[d]	Number[b]	Ratio[e]	Number[c]	Ratio[e]
Iowa	3,237	852	3,303	837	3,298	841
United States	239,033	750	279,055	695	290,420	681
Six States (Avg.)	5,069	784	5,653	738	5,792	731
Illinois	13,221	763	14,659	727	14,996	726
Minnesota	4,655	733	5,356	666	5,414	670
Missouri	6,120	706	6,677	674	6,832	671
Nebraska	1,591	887	1,694	862	1,717	840
South Dakota	526	1,294	572	1,205	575	1,162
Wisconsin	4,298	919	4,958	837	5,218	804

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[a] United States Bureau of the Census, *Statistical Abstract of the United States*, 1962.
[b] United States Bureau of the Census, *Statistical Abstract of the United States*, 1967.
[c] United States Bureau of the Census, *Statistical Abstract of the United States*, 1969.
[d] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 437, January 16, 1970.
[e] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 437, April 17, 1969.

Table 2. Population per Non-Federal Dentist for Iowa, U.S., and Six Adjacent States: Selected Years

	1960		1965		1968	
	Number[a]	Ratio[d]	Number[b]	Ratio[e]	Number[c]	Ratio[d]
Iowa	1,660	1,661	1,567	1,765	1,558	1,781
United States	98,491	1,821	104,824	1,906	109,205	1,830
Six States (Avg.)	2,490	1,596	2,534	1,646	2,533	1,682
Illinois	6,413	1,572	6,469	1,647	6,394	1,730
Minnesota	2,416	1,413	2,576	1,413	2,574	1,423
Missouri	2,432	1,776	2,395	1,879	2,390	1,741
Nebraska	925	1,526	943	1,548	956	1,520
South Dakota	311	2,188	300	2,297	303	2,195
Wisconsin	2,565	1,541	2,579	1,610	2,579	1,633

[a] American Dental Association Bureau of Economic Research and Statistics, Facts About States for the Dentist Seeking a Location, (ADA, Chicago), 1961

[b] American Dental Association Bureau of Economic Research and Statistics, Facts About States for the Dentist Seeking a Location, (ADA, Chicago), 1966.

[c] American Dental Association Bureau of Economic Research and Statistics, Facts About States for the Dentist Seeking a Location, (ADA, Chicago), 1969.

[d] American Dental Association Bureau of Economic Research and Statistics, U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 437, January 16, 1970.

[e] American Dental Association Bureau of Economic Research and Statistics, U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 420, April 17, 1969.

population-per-dentist ratio changed from 1,661 in 1960 to 1,781 in 1968, a net increase of more than seven percent.

Not only did Iowa's population-per-dentist ratio increase more rapidly than the average of neighboring states, but it was higher in each of the years measured. It should be noted, though, that these seven midwestern states had a decided advantage over the United States in population-per-dentist ratio even though the gap narrowed from 1960 to '68. For example, in 1960 the nation's ratio was 1,821 compared to Iowa's 1,661. The gap continued to prevail in 1968, with the U. S. ratio at 1,830 and Iowa's at 1,781.

Professional Nurses

Data on availability of active professional nurses relative to population in Iowa, compared to the United States and the six adjoining states, are presented in Table 3. Iowa's ratio of population per active professional nurse was under that of the United States and the six-state aggregate in each of the measured years—1951, 1962 and 1966.

Iowa's ratio went down from 477 persons per professional nurse in 1951 to 278 in 1966. The comparable 1966 ratios of the United States and Iowa's surrounding states were 330 and 318, respectively.

During this 1951-66 interval, Iowa's ratio declined more than the average ratio of the neighboring states—and that of the United States. The decline in the rate of population to nurses for the U.S. was 28 percent, that for surround-

Table 3. Population per Active Professional Nurse for Iowa, U.S., and Six Adjacent States: Selected Years

	1951		1962		1966	
	Number[a]	Ratio[d]	Number[b]	Ratio[f]	Number[c]	Ratio[e]
Iowa	5,875	477	8,555	323	9,956	278
United States	332,268	455	532,118	349	593,694	330
Six States (Avg.)	7,673	458	11,832	342	13,214	318
Illinois	21,240	410	28,890	355	33,331	324
Minnesota	7,357	405	13,192	265	14,184	253
Missouri	5,688	695	9,151	476	11,021	414
Nebraska	2,543	521	4,587	318	4,674	309
South Dakota	1,124	581	1,896	371	2,055	331
Wisconsin	8,084	425	13,278	302	14,018	298

[a] American Nursing Association, *Facts About Nursing*, New York, 1952 edition.

[b] American Nursing Association, *Facts About Nursing*, New York, 1964 edition.

[c] American Nursing Association, *Facts About Nursing*, New York, 1963 edition.

[d] United States Bureau of the Census, *Statistical Abstract of the United States: 1969*.

[e] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 420, April 17, 1969.

[f] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 384, February 13, 1968.

Table 4. Population per Registered Pharmacist in Practice for Iowa, United States and Six Adjacent States: Selected Years

	1962		1966		1969	
	Number[a]	Ratio[d]	Number[b]	Ratio[e]	Number[c]	Ratio[f]
Iowa	1,552	1,778	1,379	2,004	1,787	1,553
United States	117,377	1,584	120,162	1,631	123,512	1,610
Six States (Avg.)	2,427	1,668	2,357	1,785	2,384	1,787
Illinois	5,890	1,742	5,799	1,860	5,756	1,904
Minnesota	1,988	1,757	2,122	1,689	2,221	1,649
Missouri	2,926	1,489	2,621	1,742	2,518	1,831
Nebraska	971	1,502	998	1,445	1,009	1,440
South Dakota	456	1,542	440	1,545	458	1,452
Wisconsin	2,329	1,723	2,160	1,934	2,344	1,797

[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, 1962.
[b] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, 1966.
[c] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago, 1969.
[d] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 384, February 13, 1968.
[e] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 420, April 17, 1969.
[f] United States Bureau of the Census, *Current Population Reports*, Series P-25, No. 437, January 16, 1970 (1968 figures).

ing states was 31 percent, but Iowa's ratio went down nearly 38 percent over this period.

Both in absolute numbers of professional nurses and in population per nurse, Iowa, surrounding states, and the nation made steady improvement in each period. In 1951 and 1962, three of the states bordering Iowa had lower population-to-nurse ratios than Iowa. By 1966, of the six states only Minnesota had a lower ratio.

Pharmacists

The number of pharmacists registered to practice in the United States steadily increased, as shown in Table 4, from 1962 to 1969. The increase in number of pharmacists varied erratically in Iowa and in her six neighboring states. Table 4 shows that the average number of pharmacists in Iowa's six border states dropped from 2,427 in 1962 to 2,357 by 1966. Thereafter it recovered partially to 2,384 by 1969. Two of those six states, Illinois and Missouri, showed a steady decrease in the number of registered pharmacists; two others, Minnesota and Nebraska, showed a steady increase.

Iowa had 1,552 registered pharmacists in 1962. That number had dropped more than 11 percent by 1966; but this trend was dramatically reversed by almost a 30 percent increase in registered pharmacists (to 1,787) from 1966 to 1969. Thus, Iowa followed the U.S. trend in showing net gains following 1962 in the actual number of pharmacists registered to practice.

During the 1962-69 period the United States ratio of population-per-pharmacist increased approximately 16 percent, from 1,584 persons per pharmacist to 1,610 persons in 1969 (down from 1,631 in 1966). The aggregate ratio for the six states bordering Iowa consistently exhibited an increase, amounting to about seven percent for the 1962-69 period.

Table 5. Population per Short-term, Non-federal Hospital Beds for Iowa, United States, and Six Adjacent States: Selected Years

	1960		1965		1968	
	Number[a]	Ratio[d]	Number[b]	Ratio[e]	Number[c]	Ratio[d]
Iowa	10,790	256	12,469	222	14,562	191
United States	621,688	288	741,292	261	793,912	252
Six States (Avg.)	16,652	240	18,776	222	20,429	209
Illinois	39,731	254	45,844	232	49,122	223
Minnesota	16,516	207	18,714	190	20,412	179
Missouri	16,948	255	19,247	234	20,581	224
Nebraska	6,227	227	6,911	211	8,064	180
South Dakota	3,065	222	3,135	220	3,322	200
Wisconsin	16,882	234	18,806	221	21,073	200

[a] American Hospital Association, *Hospitals:* Guide Issue (Part Two), Chicago, August 1, 1961.
[b] American Hospital Association, *Hospitals:* Guide Issue (Part Two), Chicago, August 1, 1966.
[c] American Hospital Association, *Hospitals:* Guide Issue (Part Two), Chicago, August 1, 1969.
[d] United States Bureau of the Census, *Current Population Reports,* Series P-25, No. 437, January 16, 1970.
[e] United States Bureau of the Census, *Current Population Reports,* Series P-25, No. 420, April 17, 1969.

Iowa's population-per-pharmacist ratio increased from 1,778 in 1962 to 2,004 in 1966, but by 1969 had declined to 1,553 for a net decrease of nearly 13 percent for the period.

In both 1962 and 1966, all six states bordering Iowa had population-per-pharmacist ratios lower than Iowa's. By 1969, however, only Nebraska and South Dakota had lower ratios.

Short-term Hospital Beds

The number of short-term, non-federally-controlled hospital beds in the United States, Iowa, and six bordering states was steadily on the increase both in absolute number and relative to population during the period covered in Table 5, 1960 through 1968.

The actual number of beds in the United States increased about 20 percent from 1960 to 1968, the aggregate increase for the six states bordering Iowa was more than 23 percent, and Iowa's increase was 35 percent.

The significance of this large increase in hospital capacity is reflected in the ratio of population per short-term bed. Iowa's ratio of 256 persons per bed in 1960 was lower than the national ratio of 288 but over the aggregate average of 240 persons per bed exhibited by Iowa's six neighboring states. In fact, in 1960 all six states bordering Iowa had population-per-bed ratios lower than Iowa's.

Table 6. Comparison and Ranking of Ratios of Population to Health Services Inputs, the Nation, Iowa, and Adjacent States: Selected Years[a]

	Physicians[b]	Dentists[c]	Pharmacists[d]	Nurses[e]	Short-Term Hospital Beds[f]
Nation	3 (681)	8 (1830)	4 (1610)	7 (330)	8 (252)
Aggregate of Six Border States	5 (731)	4 (1682)	6 (1787)	5 (318)	5 (209)
Minnesota	1 (670)	1 (1423)	5 (1649)	1 (253)	1 (179)
Wisconsin	6 (804)	3 (1633)	7 (1797)	3 (298)	4 (200)
Illinois	4 (726)	5 (1730)	9 (1904)	6 (324)	6 (223)
Missouri	2 (671)	6 (1741)	8 (1831)	9 (414)	7 (224)
Nebraska	7 (840)	2 (1520)	1 (1440)	4 (309)	2 (180)
South Dakota	9 (1162)	9 (2195)	2 (1452)	8 (331)	4 (200)
Iowa	8 (841)	7 (1781)	3 (1553)	2 (278)	3 (191)

[a] Ratios of Population to Health Service Inputs in parentheses.

[b] 1967.

[c] 1968.

[d] 1969.

[e] 1966.

[f] 1968.

By 1968, however, the situation had significantly altered. While the national ratio had fallen 12.5 percent to 252 persons-per-bed, the six-state ratio was down to 209—16 percent below the 1960 figure. But the combination of slow population growth and a better than one-third expansion in bed capacity had lowered Iowa's population-per-bed ratio 25 percent, to 191. This Iowa ratio was lower than that of the United States and all the surrounding states except Minnesota and Nebraska.

Summary

Table 6 compactly summarizes Iowa's position relative to the nation and surrounding states in selected health manpower categories and provides a ranking of ratios from one to nine, with one being assigned to the lowest (most favorable) ratio.

In Table 6, Iowa compares favorably with the nation and adjoining states in terms of pharmacists, professional nurses and short-term hospital beds. However, some qualifications are in order.

First, while it is safe to assume that the bulk of pharmacists are fully employed, little is known as to how much of their time is spent providing health services (dispensing drugs) and how much time is spent managing a drug store.

Second, the data for professional nurses do not distinguish between those who are working only part-time from those who are working full-time. Moreover, the data do not distinguish those nurses who have an active licensure status, but who are not working, from those who are actively engaged in nursing.

Finally, the data on hospital beds imply nothing about utilization or occupancy. It is well known that several Iowa hospitals that are located in rural areas lack significant facilities. As a consequence these institutions are perhaps hospitals in name only and really function as overnight clinics for the physicians having staff privileges in them. Occupancy rates in such cases are extremely low and bed availability represents idle capacity not being utilized — therefore not needed.

There is no question about the virtual full-employment status of both physicians and dentists. As Table 6 shows, Iowa ranks low relative to the nation and neighboring states in terms of the availability of physician and dental services to respective populations.

SUMMARY OF FACTS PRESENTED IN SUBSEQUENT CHAPTERS

This section is intended to provide the reader with a summary of the more salient facts which characterize the 15 health manpower occupations treated in this study. The discussion of each occupation will reflect neither the analytical setting nor the caution with which the empirical results presented in subsequent chapters should be assessed. Therefore, the reader is strongly encouraged to read chapters of particular interest and not to rely on the brief abridged comments presented here.

Medicine and Osteopathy

In 1967 there were 2,911 non-federal practicing physicians residing in Iowa. Of these, 2,566 were M.D.'s and 345 were D.O.'s. Not included in the analysis of this study are 140 physicians employed by the Federal government. The ratio of population per patient care physician (M.D. and D.O.) was on the increase in Iowa from 1910 to well into the 1960's, and by 1967 there were 945 persons per patient care physician in the state —a lower figure than in previous years. In that same year, however, the United States' ratio was 686, and the Iowa ratio was higher than that of any surrounding state except South Dakota.

Some profound changes have been occurring in the geographic distribution of physicians within Iowa. Physicians have moved to the urban areas faster than the general population, thus raising the ratio of population per patient care physician in rural counties and lowering it in urban areas. In 1967, the population-per-physician ratio in non-metropolitan counties with under 10,000 inhabitants was 1,529; the ratio in metropolitan counties was 850.

In Iowa (as in the United States) the trend has been toward increased specialization. By 1967, 55 percent of all Iowa physicians were specialists; and 40 percent of these were surgical specialists.

It also appears that the average age of physicians in Iowa has been on the increase, especially in rural areas. Of Iowa's practicing physicians in 1965, 42 pereent of those in towns of 2,500 or more population were over 50 years old. In towns under 2,500, the figure was 55 percent.

Professional Nursing

Iowa compares quite favorably with the United States in ratio of population per employed registered nurse. The Iowa ratio in 1962 was 311; the United States ratio, 336. By 1967 the U.S. ratio had declined about 10 percent, to 308 During the same period, the ratio for Iowa fell about 18 percent, to 256.

In December of 1967, active Iowa licenses were held by 15,380 registered nurses who resided in the state. Seventy percent of those, 10,791, were employed. The geographic location of these "active" registered nurses indicated a pattern of settlement in those eastern Iowa counties and regions that have recently experienced rapid economic growth.

Nearly 30 percent of Iowa's registered nurses in 1968 were between the ages of 21 and 30. The approximate mean age was 39. The labor force participation rate was highest among registered nurses under the age of 25. The participation rate thereafter declines, until it begins to ascend after 35 years of age.

In 1968, registered nurses who were not married were more likely to be employed—and employed full-time—than were married nurses. Almost 63 percent of those employed were working in hospitals. About 10 percent worked in private medical or dental offices, and nearly eight percent in nursing homes.

The educational training of most of Iowa's registered nurses, as true for the nation as a whole, was obtained in hospital schools. Additionally, three-fourths of the state's registered nurses were trained in Iowa.

Most in the large group of inactive registered nurses in Iowa were young married women, and 81 percent had children living at home. About 39 percent planned to return to the labor force at some future time.

Practical Nursing

Practical nurses residing in Iowa who had been licensed by the state numbered 4,595 in December 1967. At that time, however, only 3,640 of them held active licenses. Of these, 2,811 were employed, producing a ratio of population per employed licensed practical nurse of 982. The population per active licensee was 756.

Iowa's active practical nurses are relatively young. In 1968 the mean age was about 38, with 41 percent 30 years of age or younger. An estimated 77 percent of Iowa's active practical nurses were married. About 87 percent were trained in state-approved hospital or community college programs in Iowa.

In 1968 more than 50 percent of the state's practical nurses were employed full-time, 22 percent part-time, and 28 percent percent were not in practice. More than 55 percent of those working were employed by hospitals and about one-fourth by nursing homes.

Most of the state's unmarried practical nurses were working on a full-time basis. The married practical nurse was less likely to be employed, and, if so, was likely to be employed only part-time. Most likely to be working were women age 20-or-under and 30-or-over—ages not in the peak child-bearing years.

The majority of Iowa's inactive practical nurses were young married women, nearly 67 percent being under 30 years of age and 93 percent being married. Many (39 percent) of those inactive planned to return to work in the future.

Dentistry

In 1968, 1,252 of Iowa's 1,499 dentists were engaged in full- or part-time patient care activities. Only 119 were retired. The ratios of population per active dentist for both Iowa and the United States rose during the first half of the 'sixties. Iowa's ratio peaked at 2,242 in 1965, slightly higher than the 2,223 for the United States. By 1967 the U.S. ratio had lowered to 2,156, while the Iowa ratio had declined even more—to 1,004—by 1968.

Iowa's active dentists tend to be more concentrated in the metropolitan areas of the state and are younger as a group than those of the United States. The age gap widened between 1965 and 1968 as the mean age of Iowa's dentists fell to 49 years of age. In 1968, one-third of Iowa's dentists were under 40 years of age. Dentists located in Iowa's metropolitan areas tend to be younger than those located in the non-metropolitan areas.

More than 83 percent of Iowa's active dentists in 1965 were engaged in private practice, the remainder being employed by government or as dental school faculty. Most of Iowa's dentists, 80 percent, were graduated from the University of Iowa's College of Dentistry.

Podiatry

During the 'sixties the population per licensed podiatrist ratio for both the United States and Iowa remained fairly stable, indicating—in view of rising population—a modest increase in the number of podiatrists nationally and a slighter increase for Iowa.

The population per licensed podiatrist ratio for the United States was lower than Iowa's from 1950-1968, although both decreased slightly. The U.S. ratio declined to 23,496 and the Iowa ratio fell to 26,718. Iowa's population per licensed podiatrist ratio rose to 27,247 in 1969, however.

During 1969-70, only 101 of the 182 Iowa-licensed podiatrists were in practice in the state and most of these, 88 percent, were engaged in private practice. Sixty of Iowa's 99 counties were without resident podiatrists during this period.

When Iowa first licensed podiatrists in 1921, a high school education and two years in a podiatry college was sufficient for licensure. Present law requires a high school diploma, two years of premedical education, and four years in one of the five podiatry colleges in the United States.

Chiropractic

In 1969, approximately 600 chiropractors resided in Iowa. A geographic distribution was available for the approximately 40 percent of them who were members of the Iowa Chiropractic Society (ICS). ICS members were practicing in 77 of Iowa's 99 counties, a major portion of them located in the eastern and northern parts of the state.

Iowa's ratio of population per licensed chiropractor in 1965 was 4,707, as compared to a ratio of 10,131 for the United States. Iowa's was the nation's third lowest state ratio; only New Hampshire and Missouri had lower ratios of population per licensed chiropractor. Of the 12 accredited colleges of chiropractic in the United States, the largest is Palmer College in Davenport. In 1965-65, 37 percent of the nation's chiropractic students were enrolled there, and 42 percent of the nation's 1964-65 graduates received their diplomas from Palmer.

By 1966, 48 states and the District of Columbia required licensure of chiropractors. Iowa has done so since 1921. All licensing states require as a minimum a high school education and four years of study in an accredited chiropractic college. Some states also require two years or preparatory undergraduate education.

A majority of licensed chiropractors in the United States are in independent private practice. Others are employed by firms, chiropractic schools, and clinics.

Optometry

From 1966 through 1968 the ratio of population per licensed optometrist for the United States steadily increased, reaching 9,719 by 1968. During the same period, the Iowa ratio—initially lower than the nation's—steadily declined, falling to 7,418 by 1968.

The statewide professional society for optometrists, the Iowa Optometric Assiciation (IOA), listed as members 71 percent (263) of Iowa's 371 licensed optometrists in 1968. The IOA membership includes nearly all the state's practicing optometrists. In 1968, only seven Iowa counties were without an IOA member and 55 counties had ratios of population per IOA member lower than the state's.

A 1969 survey of IOA members showed that 72 percent were at least 40 years old. Since time-series data were not available, it was not possible to discern an age trend.

Although no data were available regarding the sex distribution of Iowa's optometrists, it is known that only a few members of the IOA were women.

Pharmacy

Despite a long-term national trend toward more licensed pharmacists, the actual number of pharmacists in the United States in 1968 was lower than at the beginning of the sixties. In contrast, Iowa's 2,001 resident pharmacists in 1968 was a larger number than at anytime since 1960. The Iowa ratios of population per active pharmacist (1,541) and per community pharmacist (1,820) in 1968 were below comparable ratios for the United States, due in part to a decrease of over 9,000 in the number of licensed pharmacists in the U.S. since 1961.

During the 1960-68 period the number of pharmacists registered in Iowa increased by nearly 200. The distribution of Iowa pharmacists shows a familiar pattern of higher concentration in urbanized areas compared to less urban sections of the state.

Pharmacy is predominantly a male profession, both in Iowa and the United States; consistently less than 10 percent of all active pharmacists are women. Pharmacists under the age of 30 comprised one-fourth of all those active in Iowa in 1968, compared to only 19 percent for the United States.

Current licensing regulations in the United States require a minimum of five years of college and, in most states, a one-year internship in addition to passing a State Board of Examination.

Before the current programs were put into effect, there were other training options—such as "experience" substituting for some of the college training; as might be expected, the proportion of licensed pharmacists trained under these programs is on the wane; but in 1968 some 32.8 percent of Iowa's pharmacists reported having been trained under the older options.

Dental Hygiene

There were 154 dental hygienists residing in Iowa in 1966. Their geographic distribution, as might be expected, coincides closely with the spatial distribution of dentists among the population. Therefore hygienists tend to be located in metropolitan areas, where the demand for dental services is relatively higher and more stable.

About 55 percent of the state's dental hygienists were known to be practicing in 1966, this relatively low labor force participation rate resulting from several factors: (1) a large majority of dental hygienists were female; (2) about 83 percent were married; and (3) approximately 82 percent were in the child-bearing and rearing age span of 20 to 34.

The effect of these combined characteristics on labor force participation is illustrated by the fact that hygienists with pre-school children in the home have a participation rate less than one-half that of those without children.

As the only one who provides services directly to the patient, the dental hygienist is the only dental auxiliary licensed by the state. Dental hygienists must have at least two years of college education to be certified. Increasingly, however, hygienists are choosing a four-year bachelor's degree program for training. In 1966, 75 percent of the resident hygienists had received their college training at the University of Iowa.

Medical Technology

Since Iowa does not require licensure of medical technologists, the only source of data on this category of health professional is from the Iowa Society of Medical Technologists (ISMT). In 1969, there were 174 non-student members in the ISMT. Nearly 92 percent of them were employed either full- or part-time; 58 percent were married; about 80 percent were women. College degrees were held by 81 percent of the ISMT membership, and most employed ISMT members worked in hospital laboratories.

The characteristics of the ISMT membership probably should not be generalized to the state's total population of medical technologists because: (1) there are more employed medical technologists in Iowa than there are members of the ISMT; and (2) ISMT membership appears to be hospital oriented and probably represents, considering membership criteria, predominantly technologists on the upper rungs of the educational ladder.

The term "medical technologist" covers a wide array of health occupations. In descending order of education, there are medical technologists *per se*, cytotechnologists, histologic technicians, and certified laboratory assistants. Educational preparations for these occupations run from at least three years of college and a year's specialized training down to high school graduation and one year's training in a laboratory.

Dietetic and Nutritional Services

In 1967, 324 Iowa residents were members of the Iowa Dietetic Association (IDA), the professional society for dietitians and nutritionists. These health professionals were distributed through 61 of Iowa's 99 counties. The overall population per IDA member ratio in 1967 was 8,494.

Seventy-one percent of the IDA members were employed in 1967—52.5 percent on a full-time basis. Although no information on type of employment is available for Iowa dietitians and nutritionists nationally are employed primarily as administrative and therapeutic dietitians (64 percent) in hospitals and clinics. The rest are fairly equally apportioned as students, teachers, consultants, researchers and employees of college and school food services.

Since these two professions are not licensed in Iowa, the only educational standards set forth are those required for American Dietetic Association membership. A member must have a Bachelor of Science degree in foods and nutrition, plus an approved internship or three years' experience.

Occupational Therapy

Occupational therapy is not a licensed health profession in Iowa. Consequently the only source of information on occupational therapists was via their professional organization. The American Occupational Therapy Association (AOTA) is the national registry agency. Applicants must graduate from a degree program, intern, and pass a registry examination. Registrants are designated OTR's.

According to the Iowa Occupational Therapy Association (IOTA), there were 94 OTR's in Iowa during 1969. Not all, however, were registered and data on the non-registered OT's were not available. Among the 94 OTR's, 56 were employed, one was retired, and the rest were inactive. The employed OTR's were distributed geographically among only 16 of Iowa's 99 counties.

The fact that 90 percent of all Iowa OTR's were women may account for the high proportion of professional inactivity. All nine male OTR's were employed.

Nationally, about two-thirds of the employed occupational therapists work in hospitals; large numbers work in Federal installations. Other places of employment include rehabilitation centers, nursing homes, and teaching and research institutions.

Three federal agencies, employed 15 percent of Iowa's OTR's in 1968, eight state agencies employed 40 percent, and nine private institutions employed the remainder.

Physical Therapy

Physical therapists have been licensed in Iowa since 1965, a degree or certificate from a school of physical therapy being required in addition to passage of a State Board Examination.

A compilation of members and non-members of the American Physical Therapy Association (APTA) for the first quarter of 1970 showed that 231 physical therapists were licensed to practice and residing in Iowa.

Iowa has since 1965 had a lower ratio of population per practicing APTA member than the nation's. The 1965 ratio for the United States was 24,251, while Iowa's was 21,827. By 1967, the Iowa ratio declined to 19,097.

Iowa's 231 physical therapists gave the state a ratio of population per physical therapist of 11,913. Geographical distribution was not uniform; there were practicing APTA members in only 36 counties. In fact, 57 percent of these were concentrated in Johnson, Polk, Linn, Dubuque and Black Hawk counties. It should be noted, however, that a PT frequently attends to patients in counties other than the one in which he resides.

Nationally, only 30 to 35 percent of physical therapists are male, while in Iowa 47 percent of APTA members were men. Fifty-two percent of Iowa's practicing APTA members were men, and only 10 percent of APTA unemployed were male. Among employed APTA members in 1969, more than 91 percent were engaged in direct patient care. Those self-employed accounted for 22 percent and 65 percent were salaried by hospitals.

Radiologic Technology

There were nearly 70,000 radiologic technologists (RT's) in the United States in 1967. There are three professional organizations for RT's, the largest being the American Registry of Radiologic Technologists (ARRT). Data limited to ARRT members showed Iowa's ratio of population per RT (ARRT) to be lower and declining faster than the United States' ratio from 1965 through 1969. Iowa's ratio in 1969 was 2,808 persons per RT (ARRT). The ratio for the United States was 3,551.

The easternmost regions of the state had a higher concentration of radiologic technologists associated with the ARRT in 1969 than did the rest of Iowa. Nine of Iowa's counties did not have an ARRT-registered X-ray technologist in 1969. It was ascertained from membership lists of the various professional societies that women RT's outnumber men by about four to one.

Speech Pathology and Audiology

Since speech and hearing clinicians are not widely licensed by states and are very mobile, determining their exact numbers and locations is difficult. At best count, there were 396 speech and hearing professionals located in 85 of Iowa's 99 counties in May 1969. On this basis the state's population-per-clinician ratio was 6,949. Fifty-eight of Iowa's 99 counties were in the 5,000-15,000 ratio range.

A national survey conducted in 1966 by the American Speech and Hearing Association indicated that 51 percent of their responding members were employed in elementary or secondary schools. Universities and non-university speech and hearing clinics employed 22 percent and 17 percent, respectively.

SOME CONCLUDING COMMENTS

While it is not the purpose of the authors of this volume to provide conclusions based on the implications of the data presented for health policy making, it does seem appropriate to offer some general comments concerning what the information seems to reveal in terms of economic-institutional developments and the analytical perspective discussed earlier.

Iowa is currently going through a process of industrialization and urbanization. The diminution of the importance of agriculture as the dominant form of economic activity has promoted the rapid shift of population away from rural areas toward the larger towns and cities. The natural consequences of these developments are the concentration of people and services in cities and the deterioration of services available in declining rural areas.

Concentration of services in the more urban areas has been assisted by the phenomenon of cost economies in the production of services resulting from economies derived from large scale production. Services can be produced more cheaply and more plentifully in urban areas, thus making them more attractive places in which to live.

The data above are consistent with the observation that the same forces of urbanization and industrialization that have led to a concentration of population and services in towns and cities have also led, and continue to lead, to a concentration of health services capability in cities. Thus the data available suggest that medical service capability is becoming more regionally concentrated, centering around urban trade centers throughout the state.

This is to be expected, since health professionals are among the most highly educated and trained components of the labor force. As such, they may be expected to be highly mobile—and by virtue of their ability to command high incomes, they have strong preferences to live in urban areas that provide the more interesting services that their incomes permit them to consume.

As health professionals become more concentrated in urban areas, supporting personnel engaged in other categories of health manpower that are complementary to the production of health services (assisting health professionals), tend also to concentrate in urban areas.

Thus the data show a relative scarcity of health manpower in rural areas, relative to urban areas. But the data show something else in addition. Medical service capacity is concentrating regionally at several nodes throughout the state in a pattern not unlike the area partitioning of the state for administrative purposes proposed by the Governor's Office of Programming and Planning some years ago.

The important implication of this is that while small communities may not enjoy the residence of a physician in their community as they did several years ago, they do enjoy the existence of a medical complex of high service capability some miles away. Given the substantial improvements in communication and, particularly, transportation of recent years, residents of many rural communities have reasonable access to facilities capable of adequately meeting a wider spectrum of health care needs than a single physician could have provided in years past or could alone provide today.

In short, so long as urbanization results in regional concentration of service centers as it has in Iowa, it has certain advantages for declining rural areas that may be overlooked unless the data are considered from several points of view.

In conclusion the reader will recognize that—accepting the limitations of the data available—this study for all its comprehensiveness and depth represents only part of the overall picture of the anatomy of Iowa's health services industry and how it functions in relation to Iowa society. Recognition of this fact suggests that ultimate policy decisions should be made with an eye toward the total functioning of the whole industry of which health manpower is merely a single component, granted that it is a very important one.

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[1] Victor R. Fuchs, "The Contribution of Health Services to the American Economy, "*Milbank Memorial Fund Quarterly* (October, 1966), 65-103.

[2] A more elaborate discussion on this point may be found in Jerald R. Barnard, "The Economics of Medical Service and Planning Regions," Health Economics Analysis Research Center, Processed November, 1968.

[3] For a clear statement of this distinction see, James R. Jeffers, Mario F. Bognanno and John C. Bartlett, On the Demand *vs.* Need for Medical Services and the Concept of "Shortage," *American Journal of Public Health* (September, 1970).

[4] A more elaborate statement of differences between the health services industry and other private industries may be found in, Howard R. Bowen and James R. Jeffers, *The Economics of Health Services*, New York: McCaleb-Seiler Press, September, 1970.

[5] Frank Dickerson, *Distribution of Physicians by Medical Service Areas* (Chicago: American Medical Association, 1964), p. 1.

[6] Rashi Fein, *Physician Services for the 1970's*, Washington, D.C.: The Brookings Institution, 1967, pp. 3-4.

MEDICINE AND OSTEOPATHY

Doctors of medicine and osteopathy play important dual roles in the production of health care services. Not only do these physicians provide important services in the performance of examination, diagnostic, surgical, and therapeutic procedures, but they also coordinate the health care services provided by auxiliary health personnel.

Because of their role as leaders of the health team, an ideal inventory of physician health services performed would include a count of the physicians available and the productivity of the physicians. The productivity of an individual physician depends not only on his level of training, his experience, hours worked, and number of patient visits but also on the number and kinds of personnel he coordinates and the amount of diagnostic and other types of equipment he has at his disposal.[1]

Unfortunately, there is only a limited amount of data available on the inputs which affect an individual physician's productivity and on the level and the distribution of auxiliary inputs.[2] For this reason the information presented on the supply of physicians will be of a somewhat gross nature.

Limited resources, and the general scope of this study, did not permit a rigorous examination of current shortages and projections of future shortages of physician services. To provide this type of information, a complete analysis of demand and projections of future demand for physicians' services ideally should be undertaken. In this study we limit ourselves to population as a measure of demand in our numerical tables. The limitations of this measure as a demand measure have been enumerated earlier in this study.[3]

Briefly, then, this discussion deals with the gross characteristics of Iowa physicians, their absolute number, their number relative to population, their geographic and age distributions and distribution by medical specialties, with some comparisons with U.S. data and data of other states. Part two provides some information on the changes in the characteristics of Iowa physicians over time. In the third part, more detailed information about the sources of physician supply is provided. Information on the number of graduates of the educational institutions and where they are located is enumerated. The chapter closes with an overview of physicians in Iowa.

CHARACTERISTICS OF IOWA PHYSICIANS

Population to Physician Ratios

Iowa had 2,911 non-Federal physicians in 1967,[4] 2,566 M.D. and 345 D.O., providing patient care. In addition, 375 physicians were engaged in non-patient care activities, such as administration, research, teaching on medical school facilities, and in professional retirement. Not included in the above totals are 140 Federal physicians[5] in Iowa in 1967, of whom 230 provided patient care.

Table 1. Number of Physicians in Relation to Population: December 31, 1967[a]

Location	Civilian Population	Non-Federal Physicians Providing Patient Care			
		Number			Population/ Physician
		M.D. and D.O.	M.D. only	D.O. only	
United States	195,669,000	258,279	247,256	11,023	686
Iowa	2,752,000	2,911	2,566	345	945
Illinois	10,825,000	13,525	13,313	212	800
Minnesota	3,577,000	4,851	4,802	49	737
Missouri	4,565,000	5,859	5,030	829	779
Nebraska	1,423,000	1,511	1,479	32	942
South Dakota	667,000	533	503	30	1,252
Wisconsin	4,185,000	4,693	4,539	154	892

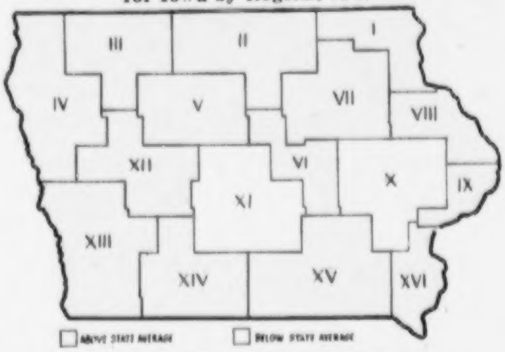
[a] *Health Manpower: United States 1965-1967*, pp. 17-18, and *American Osteopathic Association Yearbook and Directory of Osteopathic Physicians* (1968) American Osteopathic Association, Chicago, Illinois.

Some perspective may be gained on the number of physicians in Iowa by relating their number to total population. In Table 1 are listed the population-to-physician ratios for the U.S., Iowa and surrounding states. It is pertinent to note that Iowa had a higher population-to-physician ratio than the U.S. and a higher ratio than any of the surrounding states, excepting South Dakota.

Geographic Distribution of Physicians in Iowa

Aggregated data for the state as a whole can hide the considerable variation that exists in the distribution of physicians. Map 1 partly reveals this variability in the distribution of physicians relative to population that prevailed in 1967. The areas depicted in Map 1 are the Governor's Office of Planning and Programming regions.

Map 1. Population per Patient Care Physician for Iowa by Region: 1967



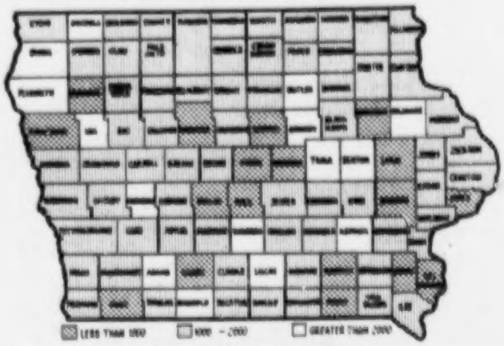
Source: See Appendix A, Table 3.

The shaded regions indicate a ratio of population per patient care physician (M.D. and D.O.) that exceeded the state's ratio in 1967. Two regions, X and XI, had ratios below that of the state in 1967, of 945 persons per patient care physician. Region X, which incorporates the University of Iowa's College of Medicine, had a ratio of 500 persons per patient care physician; Region XI, which incorporates the Des Moines College of Osteopathic Medicine and Surgery, had a ratio of 777.

In both of these regions, however, *population* is a particularly poor measure of potential demand for physician services because (1) a large proportion of the state's indigent population relies on the University Hospitals (Region X) for medical care; and (2) medical referrals to Des Moines (Region XI) or Iowa City (Region X) come from throughout the state and midwest because of the large number of specialists and specialized medical facilities available at these locations.

A more detailed picture of the distribution of physicians in Iowa is provided by a breakdown by county of the ratios of population per patient care physician as presented in Map 2. (Appendix A. Table 3, provides a more complete listing of the data). The map shows considerable diversity in the population-per-physician ratio between counties.

Map 2. Population per Patient Care Physician for Iowa by County: 1967



Source: See Appendix A, Table 3.

***Map with county identifications of legible size on Page 91, Appendices Section.**

In some cases, a low ratio gives an incorrect impression of the medical services available to the county's residents. For example, a number of counties with low population-to-physician ratios—Cherokee, Page, Buchanan and Henry—contain state mental hospitals. These hospitals provide services to patients who come from a number of counties.

Johnson county, which had the lowest population-to-physician ratio, contains the University Hospitals and a Veterans Administration hospital. However, even if the data were adjusted for the locations of state and federal hospitals, considerable variation in population-to-physician ratio remains for other factors to explain.

A complete explanation of the distribution of physicians in Iowa is outside the scope of this study. Preliminary work on such a task has been reported in an unpublished paper by Jeffers and Bognanno.[6] Their study found that, in addition to population, such factors as per capita income, urbanization, age, and the sex composition of the popoulation played significant roles in explaining the geographic distribution of Iowa's practicing physicians.

General practitioners were most influenced in locational choice by population and per capita income of the county. Specialists, on the other hand, were more influenced by population, the availability of hospital services, the age composition of the resident population, and by degree of urbanization than by the area's per capita income. These latter results are not surprising considering the greater dependence of specialists on hospital facilities and ancillary personnel and the fact that many specialties are oriented toward the treatment of females.

The marked preference of physicians for urban counties can be detected in the county map of Iowa (Map 2). Counties with large population centers tend to have the lowest population-to-physician ratios. This concentration of physicians in urban areas is consistent with the findings in the Jeffers and Bognanno study. Urban counties tend to have the highest per capita income, the best hospital facilities and ancillary personnel, not to mention the social-cultural attraction of urban life to the doctor.

In a recent survey of physicians in Iowa, Peterson[7] reported that 41 percent of rural physicians stated that they would move to a different location if given a chance to start their practice over again. Fifty percent expressing a desire to move mentioned moving to a larger community. Only 19 percent of the urban physicians expressed a desire to move.

The disparity between rural and urban population-physician ratios is not, however, completely matched by differentials in services available to urban and rural dwellers. These ratios do not reflect that many rural dwellers obtain specialized medical treatment in larger communities. People in rural areas having hard surface roads may obtain medical care quickly, even if they live 20 to 30 miles from the nearest physician.

Moreover, due to the heavy concentration of specialists in the urban areas, medical care of a general nature may not be as available in those areas as the figures imply. In 1967, for example, 50 percent of the non-hospital based medical physicians in Iowa who provided patient care were specialists. In Polk, Linn and Blackhawk counties, the most populous counties in the state, the percentages of specialists among non-hospital based physicians providing patient care came to 77, 59, 67 percent, respectively.

But despite the factors mentioned that reduce the disparity between the urban and rural availability of physicians' services, these services are definitely less available in rural areas. Table 2 illustrates this quite clearly.

In this table, the population-physician ratios for counties with under 10,000 population are compared with the population-physician ratios of counties with over 10,000 population and with those counties classified as metropolitan. The population-per-physician ratio for counties with under 10,000 population is 1.6 times greater than the ratio for all other counties, and the population-physician ratio in counties of less than 10,000 is 1.8 times that of metropolitan counties.

Specialty Composition of Physicians in Iowa

The quantity and quality of physicians' services available to the people of Iowa depends not only on the number of physicians in Iowa but, among other things, also on the individual physician's amount of training. The variety and geographic distribution of specialized physicians' services available in Iowa can be gleaned from the detailed tables in Appendix A.

Table 2. Iowa's Patient Care Physicians Classed by County Size: 1967[a]

County Classification	Number of Counties	Population	M.D. only	D.O. only	M.D. and D.O.	Population/ Physician
Metropolitan Counties	7	948,180	969	147	1,116	850
Class 1	14	120,830	55	24	79	1,529
All except Class 1	85	2,631,170	2,511	321	2,832	929
Ratio of Class 1 to Metropolitan Counties						1.8
Ratio of Class 1 to all others						1.6

Explanation:

Classes of counties –

1 – Non-Metropolitan counties with under 10,000 inhabitants
2 – Non-Metropolitan counties with 10,000 to 25,000 inhabitants
3 – Non-Metropolitan counties with 25,000 to 50,000 inhabitants
4 – Non-Metropolitan counties with over 50,000 inhabitants
5 – Counties considered potential SMSA's
6 – Counties in SMSA's with 50,000 to 500,000 inhabitants
7 – Counties in SMSA's with 500,000 to 1,000,000 inhabitants
8 – Counties in SMSA's with 1,000,000 to 5,000,000 inhabitants
9 – Counties in SMSA's with 5,000,000 or more inhabitants

County classes 6 through 9 are considered standard metropolitan statistical areas (SMSA).

The nine county population classifications are the Demographic County Classifications which are used by the Survey Research Department of the American Medical Association and appeared in the 1967 *Distribution of Physicians, Hospitals and Hospital Beds in the U.S.* Department of Survey Research, American Medical Association, Chicago, 1968.

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[a] See Appendix A, Table 3.

More general information about the degree of specialization is provided in Charts 1 and 2 and Tables 3 and 4. In 1967, more than 50 percent of all Iowa physicians were specialists; and more than 40 percent of these were surgical specialists.

In the country as a whole as well as in Iowa, the trend has been for the percentage of specialists in the physician population to grow. From the standpoint of the availability of medical services to the consumer, this trend is a mixed blessing.

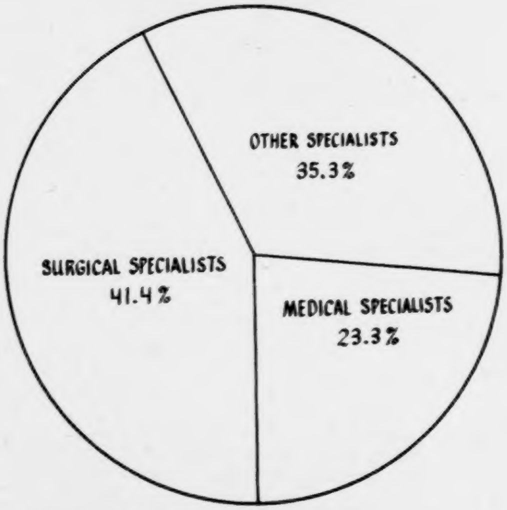
The increasing specialization provides the consumer with a greater variety of highly trained physicians and makes more available the latest knowledge in those areas where medical frontiers are being rapidly pushed back. On the other hand, a growing percentage of specialists in the physician population may reduce availability of general physician services in areas of low population and physician density, or in cities with high concentrations of specialists.

Age Composition of Physicians In Iowa

While the number of physicians in patient care provides information useful in evaluating the amount of physician manpower currently available, the distribution of physicians by age contributes information as to the availability of future physician services — since young physicians will provide more total man-years than old ones.

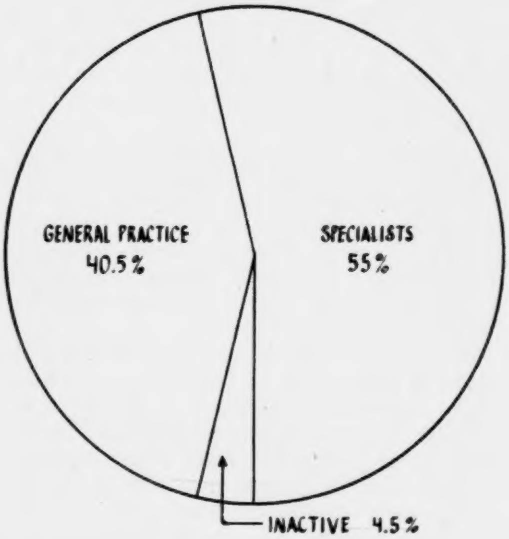
Table 5 shows the 1967 distribution of Iowa physicians by age. Nearly 25 percent of the physicians were over 60 years of age; at the same time, less than 50 percent were over age 50. Fifty years is considered the mid-point of a professional medical career.

Chart 1. Allocation of Physicians for Iowa by Type of Specialty: 1967



Source: See Appendix A, Table 3.

Chart 2. Allocation of Physicians for Iowa by Type of Practice: 1967



Source: See Appendix A, Table 4.

Table 3. Number and Percentage of Iowa Physicians (M.D. and D.O.) by Type of Specialty: 1967[a]

	Medical Specialties	Surgical Specialties	Other Specialties	Total
M.D. (Non-Federal)	409	719	564	1,692
Percentage of Total M.D. Specialties	(24)	(42)	(33)	
D.O.	11	27	75	113
Percentage of Total D.O. Specialties	(10)	(24)	(66)	
Total Physicians	420	746	639	1,805
Percentage of Total Physician Specialties	(23)	(41)	(35)	

[a] See Appendix A, Tables 4 and 5.

Physicians in rural communities are, on the average, older than those in larger communities. Data for practicing medical physicians in 1965 showed (See Table 6) that 55 percent of medical physicians in towns under 2,500 in population were older than 50 years of age. In towns over 2,500 in population only 42 percent of the physicians were over 50 years old.

The data on age distribution also show that the average age of general practitioners in the larger communities tends to be greater than that of specialists. In the rural areas, the average age of specialists is more in line with that of the general practitioners. This would suggest that specialists trained in recent years have chosen the larger communities more than those in the past.

TRENDS IN THE CHARACTERISTICS OF IOWA PHYSICIANS

Past changes in the characteristics of Iowa physicians provide some information on changes in characteristics which may be expected in the future. These trends are the framework in which policies regarding physician manpower in Iowa must be set.

In every decade from 1910 through 1960, the total number of medical physicians in Iowa declined. Since the population of Iowa increased during the five decades, the population-per-physician ratio increased even more. (See Table 7.) For the United States as a whole, medical physicians increased nearly as fast in relative number as the population. As a result, the population-per-physician ratio for the United States increased only slightly.

Table 4. Numbers and Percentage of Iowa Physicians (M.D. and D.O.) by Type of Practice: 1967[a]

	General Practice	Specialties	Inactive	No Information	Total
M.D. (Non-Federal)	1,071	1,692	126		2,889
Percentage of Total M.D.	(37)	(58)	(4)		
D.O.	248	113	17	19	398
Percentage of Total D.O.'s	(62)	(28)	(4)	(5)	
Total Physicians	1,319	1,805	143	19	3,287
Percentage of Total Physicians	(40)	(55)	(4)	(0.5)	

[a] See Appendix A, Table 6.

Table 5. Age Distribution of Total Physicians (M.D. and D.O.) for Iowa: 1967[a]

	Under 30	30-39	40-49	50-59	60-69	70 and over	Percent 50 and over	Percent 60 and over
M.D. (Non-Federal)	217	698	768	550	372	284	41.7	22.7
D.O.	11	37	97	100	94	59	63.5	38.4
Total Physicians	228	735	865	650	466	343	44.3	24.6

Selected Characteristics of the Physician Population 1963 and 1967. Special Statistical Series, American Medical Association and *American Osteopathic Association Yearbook and Directory of Osteopathic Physicians*, American Osteopathic Association, 1968.

Table 6. Percentages of Medical Physicians in Iowa Older-than-50 and Older-than-60 by Town Size and Type of Practice: 1965[a]

	Percent of Medical Physicians Older Than 50			Percent of Medical Physicians Older Than 60		
City Size	General Practitioners	Specialists	Total Medical Physicians	General Practitioners	Specialists	Total Medical Physicians
Under 2,500	55	57	55	33	25	32
Over 2,500	50	38	42	24	15	19
Over 10,000	50	36	40	26	14	18

[a] Derived from John C. MacQueen, "A Study of Iowa Medical Physicians," *The Journal of Iowa Medical Society*, November, 1968.

Although complete data are not available for the 1960 decade, it appears that the number of medical physicians in Iowa increased in the 10-year period, breaking the 50-year downward trend. In 1967, the total number of medical physicians (including those federally employed) in Iowa was 2,908, an increase from 2,792 in 1960. Since the population increased very little in Iowa during 1960's, the population-per-physician ratio has improved slightly.

During the past 60 years, people in Iowa—and in the United States—have been locating cities and other urban areas in ever increasing numbers at the expense of rural communities. This phenomenon is even more striking as reflected in the location of physician practices. Tables 8 and 9 clearly depict the relative magnitudes of the shifts in location of the population and of physicians.

Table 7. Number of Non-Federal Medical Physicians[a] and Population-Physician Ratios in the United States and Iowa, by Decade: 1910-1960[b]

Year	Number of Physicians		Iowa Population	Population-Physician Ratio	
	U.S.	Iowa		U.S.	Iowa
1910	135,000	3,653	2,224,771	683	609
1920	144,977	3,536	2,403,630	731	680
1930	153,803	3,125	2,470,939	801	791
1940	175,163	3,084	2,538,268	754	821
1950	203,400	2,889	2,621,073	749	908
1960	243,062	2,792	2,757,537	743	988
1967[c]	277,177	2,889	2,752,000	706	953

[a] All medical physicians with M.D. degrees, whether in practice or not.

[b] *American Medical Directory* (Chicago Illinois, American Medical Association, 1909, 1912, 1914, 1916, 1921, 1929, 1931, 1940, 1950, 1960) and Appendix A, Table 1.

[c] See Appendix A, Table 1.

The ratio of population per medical physician in rural Iowa has increased substantially from decade to decade since 1910, reaching a high of 3,017 in 1960. In contrast, the ratio of population per medical physician in urban Iowa increased much less over the same time period.

Table 8. Medical Physician Coverage of Urban Population in Iowa: 1910-1960[a]

Year	Urban Population[b]	Urban Physicians	Population per Medical Physician
1910	680,000	1,625	418
1920	875,000	1,861	470
1930	979,000	1,840	532
1940	1,084,000	1,828	594
1950	1,246,000	1,868	655
1960	1,463,000	1,901	770

[a] John C. MacQueen, "A Study of Iowa Medical Physicians," *The Journal of the Iowa Medical Society*, November 1968, pp. 1129-1135.

[b] Urban definition used here is the one employed by the Bureau of the Census. Anyone living in a town with a population over 2,500 people is an urban dweller.

Two considerations must be kept in mind in any evaluation of the effect this relative movement of physicians away from the small towns has had on the availability of medical services in the rural areas. First, improved and faster transportation in the rural areas partially compensated for and was partially the result of the relative movement from rural areas. With hard surface roads and automobile transportation, a doctor of today who is 10 miles away is closer in time than a doctor three miles away was in the horse-and-buggy days.

This means that it may be possible for the present day rural dweller to obtain medical services as quickly in a larger nearby town as his grandfather could obtain them in his village. Second, the medical care delivery system has undergone a complete reorganization during the past 50 years. Today, the patient is brought to the physician rather than the physician going to the patient.

Table 9. Medical Physicians Located in Rural Areas Relative to Population[a] **in Iowa: 1910-1960**

Year	Rural Population	Rural Physicians	Pop. per Medical Physician
1910	1,545,000	1,972	783
1920	1,529,000	1,609	950
1930	1,492,000	1,142	1,306
1940	1,454,000	1,040	1,398
1950	1,375,000	719	1,912
1960	1,295,000	429	3,017

[a] Derived from John C. MacQueen, "A Study of Iowa Medical Physicians," *The Journal of the Iowa Medical Society*, November 1968.

This saves the modern day rural physician considerable traveling time. The time saving allows each physician to handle many more cases, thus increasing his productivity manyfold over that of the physician of 50 years ago.

Viewed from this perspective, the relative movement of physicians from rural areas is not as calamitous as it would appear at first sight. The improved efficiency in travel does not completely compensate for lack of medical physicians in an area, however, when the area is as large as a county. By 1960, the ratio of population per medical physician had reached over 2,000 in a large number of counties and over 3,000 in three counties. The ratio had reached nearly 4,000 in one county, whereas in 1910, only one county had a population per medical physician ratio over 1,000. (See Appendix A, Table 7.)

Table 3 (Appendix A) shows that in 1967 the population per patient care physician (M.D. and D.O.) ratio was over 2,000 for a number of counties, and above 3,500 in one county.

The general preference of physicians for larger communities and the non-replacement of those who retire in rural areas has resulted in a reduction in the number of rural-area physicians, and in an increase in the average age of physicians practicing in rural Iowa. A more aged physician population means that future attrition rates will be faster.

Table 10. Medical Physicians Age 60 or Older in Rural Villages in Iowa[a] **by Decade: 1910-1965**

Pop. of Village During Resp. Decade	Percentage of Medical Physicians Age 60 or Older						
	1910	1920	1930	1940	1950	1960	1965
Under 500	8	18	34	54	64	48	56
500-999	11	18	30	45	46	36	38
1000-1499	13	23	26	40	45	25	28
1500-2499	15	24	36	42	41	25	26
2500-10,000	--	--	--	--	--	--	21
Over 10,000	--	--	--	--	--	--	18

[a] Derived from John C. MacQueen, "A Study of Iowa Physicians," *The Journal of the Iowa Medical Society*, November 1968.

Table 10 presents indirect evidence of the rising mean age among Iowa's rural physicians. The percent of medical physicians 60 years of age or older was considerably greater in 1965 than it was in 1910. However, one qualification to this interpretation of the data must be made: these data probably overstate the *relative* increase in age of rural physicians, since the average age of all physicians has increased in the past 50 years due to the longer educational commitment of currently trained physicians.

Another trend among medical physicians has been the increasing tendency to specialize. Table 11 shows that 62 percent of Iowa's active medical physicians in 1940 were general practitioners. By 1965, this percentage had decreased to 33. Specialization of physicians in sparsely populated areas can mean a reduced amount of a general medical services available to the population, unless the specialists are willing and able to treat patients with illnesses outside their areas of specialization.

Table 11. Number of Practicing M.D. General Practitioners[a] and Specialists in Iowa: 1940-1965

	1940	1950	1960	1965
M.D. Physicians	2,868	2,588	2,330	2,412
M.D. General Practitioners	1,792	1,466	1,164	809
M.D. Specialists	1,076	1,222	1,166	1,603
Percent of M.D.'s who are in general practice	62	57	50	33

[a] *American Medical Directory* (Chicago, Illinois, American Medical Association, 1940, 1950, 1960, 1965).

SOURCES OF SUPPLY OF PHYSICIANS IN IOWA

The supply of physicians in Iowa changes according to the number of physicians entering practice in the state and the number of established physicians leaving practice. Physicians leave their practice as a result of death or retirement, transfer of practice to another state, or transfer out of the medical profession. Physicians entering practice in Iowa may have transferred from another state, or they may be entering practice from their internship or residency.

Complete yearly information on all sources of supply is not available. However, information is available on where Iowa physicians obtained their medical training. Such information provides a picture of past sources of physician manpower in Iowa and a basic framework in which to assess future physician availability.

Medical Physicians

Iowa has one state-supported medical school, the University of Iowa's College of Medicine located at Iowa City. Through 1967, the College of Medicine had 3,729 living graduates. Despite the large number of medical physicians trained at the University of Iowa, the majority of Iowa's practicing medical physicians were trained in a university outside of Iowa.

In 1967, 1,300 of the medical physicians practicing in Iowa had obtained their degrees in Iowa, whereas 1,337 had obtained their degrees outside Iowa. Through 1967, out of the 3,729 living graduates of Iowa's College of Medicine 2,429 had left the state. This means Iowa is a net exporter of trained medical physicians, i.e., more Iowa-trained physicians have left the state than medical physicians trained elsewhere have entered Iowa.

The percentages of Iowa College of Medicine graduates from 1955 to 1965 who practice in Iowa are tabulated in Table 12. The retention rate varied between 28 and 42 percent and averaged 33 percent for the 10-year period.

If the same retention rate continues as the number of graduates increases, the number of Iowa-trained medical physicians entering practice in Iowa should increase in the future. Table 13 shows the number of medical students, interns and residents is projected to increase during the next several years; but it will be six to 10 years before the increased enrollment will raise the number of physicians entering practice.

Table 12. Percentage of College of Medicine Graduates Who Remain in Iowa to Practice[a]

Year	Number in Class	Graduates practicing in Iowa	Percentage of graduates practicing in Iowa
1955	107	37	35
1956	110	31	28
1957	97	31	32
1958	105	30	28
1959	99	37	37
1960	104	32	31
1961	96	35	36
1962	111	40	36
1963	117	49	42
1964	101	32	32
1965	99	27	27
Total	1,146	381	33

[a] University of Iowa College of Medicine.

Table 13. Enrollments and Projected Enrollment Pre-M.D. and Post-M.D. Students College of Medicine[a]

Year	Medical Students	Interns and Residents
1964	454	208
1965	465	242
1966	486	238
1967	496	280
1968	492	273
1969	498	283
1970	537	291
1971	556	299
1972	584	307
1973	626	315
1974	654	322

[a] University of Iowa College of Medicine.

During the past decade, more medical physicians have been licensed to practice in Iowa than have discontinued practice. Membership data from the Iowa Medical Society (Table 14) show that "transfer" was the greatest cause of physicians discontinuing practice in Iowa. Many of the transfers were to residency or the military service.

Table 14. Number of Physicians Who Discontinued Practice in Iowa: 1963-1969[a]

Year	1963	1964	1965	1966	1967	1968	1969
Transfers	106	54	55	65	79	53	54
Deaths	46	41	52	39	39	42	45
Not in Practice	18	20	13	15	26	25	21
Total	170	115	120	119	114	120	120

[a] Iowa Medical Society, Des Moines, Iowa.

Table 15, however, shows that new physicians licensed to practice more than compensated for the outflow of medical physicians from practice in Iowa. If this pattern continues, a continuing increase in the number of medical physicians practicing in Iowa can be expected—even without allowing for an increased number of graduates from the state's medical school.

Iowa's experience with regard to the retention of medical physicians is not exceptional. In view of the mobility of the United States population and the lack of restrictions on interstate travel, it is common for individuals to receive high school, college or other training in one location or state and to work in another.

This is consistent with the national philosophy of free movement of goods and people across state lines. A comparison with similar experiences of other states puts the Iowa data in better perspective. Such a comparison is provided in Table 16.

The Iowa medical school experience appears very much the same as that of other states selected from the midwestern area. A high percentage of all the medical school graduates in the states depicted in Table 16 perform patient care. Among all of Iowa's living graduates, 89.7 percent are performing patient care; while 95.8 of Iowa's recent graduates are performing patient care. These figures refute the often heard assertion that a relatively large percentage of recent graduates are going into research or other non-patient-care activities.

Table 16 shows that the percent of recent graduates going into general practice is lower than that of all graduates, for all of the midwestern states with the exception of Nebraska. Iowa's proportion of recent graduates going into general practice ranks second to Nebraska's. The proportion of recent graduates going into general practice is lowest for the more populous states, Illinois and Michigan. Michigan and Illinois also have the largest medical schools.

The proportion of graduates remaining in Iowa is larger for the recent classes than for all living graduates. The most populous states, Illinois, Michigan and Minnesota, have the highest proportion of graduates who remain in the state. These states also have had the highest population increases in recent decades.

Table 15. Number of Newly Licensed Medical Physicians in Iowa: 1963-1969[a]

Year	1963	1964	1965	1966	1967	1968	1969
Numbers	190	216	191	185	216	212	223

[a] Iowa Medical Society, Des Moines, Iowa. These figures, of course, represent the maximum number of newly established practices in any given year.

Osteopathic Physicians

The College of Osteopathic Medicine and Surgery in Des Moines is one of six colleges of osteopathic medicine in the country. The others are: the Chicago College of Osteopathy, the Kansas City College of Osteopathy and Surgery, the Kirksville College of Osteopathy and Surgery, the Philadelphia College of Osteopathy, and the Michigan College of Osteopathic Medicine—which enrolled its first class for the 1969-70 school term.

Seventy percent of the osteopathic physicians practicing in Iowa received their education in Iowa. In 1967, 281 of the osteopathic physicians practicing in Iowa had received their education in Iowa, while 117 received their education in other states. This high percentage should not be surprising, considering that there were then only four other colleges of osteopathy in the nation.

Table 17 shows that enrollments and the number of graduates from osteopathic colleges — including Iowa's—have been steadily increasing during the past several years. Total enrollment in the six colleges reached 1,997 for the 1969-70 school term. The colleges graduated 427 in 1969 and the 1970 figure is expected to be up to 433.

Table 16. State Medical Schools[a]

	Minn.	Colo.	Ill.	Iowa	Kan.	Mich.	Neb.	Wisc.
Total Living Graduates through 1967	5,181	2,457	6,735	3,729	3,285	5,963	4,550	2,444
Graduates 1960-64	612	382	881	524	474	858	484	388
Percentage of Graduates performing patient care								
All Grads	87.4	89.9	90.5	89.7	91.7	86.9	91.6	89.4
1960-64 Grads	95.2	87.6	96.0	95.8	95.5	95.1	95.8	94.3
Percentage of Graduates in general practice								
All Grads	28.2	24.4	24.4	30.1	29.5	18.4	22.8	21.6
1960-64 Grads	25.9	22.5	14.8	26.7	20.8	11.8	27.6	18.2
Percentage of Graduates in state where educated								
All Grads	46.7	38.8	45.6	35.7	34.4	44.8	20.3	41.6
1960-64 Grads	48.6	39.2	45.0	40.0	34.8	47.4	26.0	36.5

[a] Special Statistical Series: Medical School Alumni, American Medical Association, Chicago, Illinois, 1968.

Several of the colleges have expansion plans in various stages of development. Enrollments and new graduates of osteopathic colleges should continue to increase at a possibly growing rate over the next several years. Despite these increases, however, it is not anticipated that osteopathic physicians will comprise more than a small proportion of the total physician manpower in the U. S. or Iowa in the foreseeable future.

Table 17. Colleges of Osteopathy Enrollment and Graduates[a]

Enrollment	**1965-66**	**1966-67**	**1967-68**	**1968-69**	**1969-70**
CCO	248	272	282	296	301
COMS	307	317	338	338	348
KC	400	414	428	433	446
KCOS	373	395	396	405	421
MCOM	—	—	—	—	20
PCOM	353	365	379	407	461
Total	1,681	1,723	1,823	1,879	1,997
Graduates	**1965**	**1966**	**1967**	**1968**	**1969**
CCO	45	50	56	60	67
COMS	76	66	68	79	81
KC	103	88	97	106	100
KCOS	98	73	101	93	89
PCOM	73	83	83	89	90
Total	395	360	405	427	427

CCO – Chicago College of Osteopathy
COMS – College of Osteopathic Medicine and Surgery, Des Moines, Iowa.
KC – Kansas City College of Osteopathy and Surgery
KCOS – Kirksville College of Osteopathy and Surgery
MCOM – Michigan College of Osteopathic Medicine
PCOM – Philadelphia College of Osteopathic Medicine

[a] *Journal of the American Osteopathic Association*, January issues: 1966-1970.

SUMMARY

The preceding section presented the characteristics of current Iowa physician manpower and some information on changes in these characteristics over time. It demonstrated that, until recently, population per physician has been increasing in Iowa. This increase in population per physician has been the largest in rural areas, because the physician population in Iowa has shifted toward urban areas faster than has the general population. Iowa physicians, like most physicians in the country, have tended to become more specialized. It also appears that the average age of Iowa physicians, particularly in the rural areas, has increased.

The medical school in the state has increased its enrollment and plans to increase it even more in the future. This, it is hoped, will result in an increasing number of physicians entering practice in Iowa. More than half of Iowa's medical school graduates leave the state and more than half of the practicing medical physicians in Iowa were educated in other

states. This is in line with the experience of many other states and is consistent with the national philosophy of free movement of goods and people across state lines.

The chapter concentrated on the availability of physician services, without discussing the demand gauged by willingness and ability to pay for these services — except to the extent that this is embodied in population. Demand, defined in the above sense, probably has increased relative to population in the past 60 years in Iowa. Per capita real income has increased over the period, which should increase demand for physician services relative to population. Increased education and taste changes resulting from increased awareness of the benefits of health care have also probably expanded the demand for medical services. Increases in the relative price of physician services would incline to offset these factors; but greater usage of prepaid medical insurance has probably more than offset any relative increase in physician fees.

As to supply, the increase in physician services has probably been greater than the increase in the number of physicians, because of vastly increased physician productivity (increase in patient visits per physician per day) during the past 60 years. A major factor in this increased productivity was a revolution in the health care delivery system which occurred during this period.

Instead of the physicians delivering his services to the patient, the patient now visits the physician—which has resulted in a substantial increase in physician productivity. Other factors that have increased the physician productivity include a greater employment of ancillary personnel and increased use of diagnostic and other types of equipment. One study[8] found that the number of patient visits had increased from about 50 per week in 1930 to 125-165 a week in 1955.

Not only have services per physician increased substantially because of these changes, but the quality of the service has been improved. This better quality of service, which leads to a larger percentage of beneficial patient visits, has resulted from an increase in the physician's knowledge, improved drugs, and better equipment.

If the problem of providing physician service is viewed strictly on the basis of medical need, changes in population should closely relate to changes in physician-service requirements. Even using the need standard, though, increases in physician productivity prevent employment of population-per-physician ratios as evidence of increased shortage of physician services. Geographic distributional differences in population-per-physician may provide some such evidence; but this is qualified by the fact that transportation means for bringing patients to physicians in rural areas have greatly improved.

In short, the facts show a larger population-per-physician ratio and greater concentrations in the geographical distribution of physicians in Iowa with the passing of time. Whether this means a literal decrease in availability of physician services to the population would require additional facts and a more comprehensive analysis of available facts than is provided here. It is certain, however, that as the population-per-physician ratio increases and the geographical distribution of physicians becomes more concentrated, the cost of obtaining physicians services has increased for the rural population.

To compute the total cost of obtaining physician services, the cost of transporting the patient to the physician must be added to the physician's fees. Residents of sparsely populated rural areas must in the aggregate pay a large transportation cost to obtain physician services if the physicians are located in larger towns some distance away.

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[1] The American Medical Association has initiated surveys to obtain some information on numbers and kinds of patient visits, experience, hours worked, and training of physicians. See Theodore, Christ N. and Sutter, Gerald E. "A Report on the First Periodic Survey of Physicians," *The Journal of the American Medical Association,*

[2] Other parts of this study provide information on the available auxiliary personnel for physicians in Iowa. The information does not, however, give the amounts and distribution of these personnel per physician.

[3] See Introduction.

[4] See Appendix A, Table 6.

[5] *Health Manpower United States,* U.S. Department of Health, Education, and Welfare, Public Health Service, Health Services and Mental Health Administration, Washington, D.C., November 1968, pp. 17-18; and *American Osteopathic Association Yearbook and Directory of Osteopathic Physicians,* American Osteopathic Association, Chicago, Illinois, 1968.

[6] James R. Jeffers and Mario F. Bognanno, "Factors Explaining Physicians Distribution Among Iowa Counties," (Unpublished manuscript, University of Iowa, Iowa City, Iowa, 1969).

[7] Gary R. Peterson, *A Comparison of Selected Professional and Social Characteristics of Urban and Rural Physicians in Iowa,* (Health Care Research Series Number 8, Graduate Program in Hospital and Health Administration, 1968).

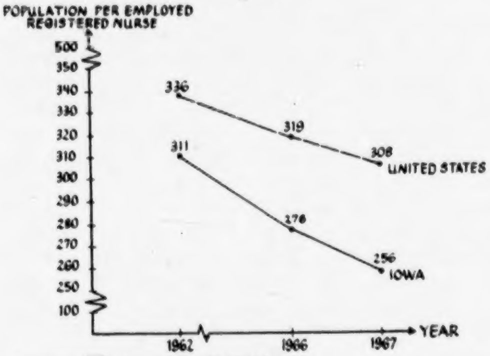
[8] Reported in Herman M. Somers and Anne R. Sommers, *Doctors, Patients, and Health Insurance.* The Brookings Institution, Washington, D.C., p. 48, 1961.

PROFESSIONAL NURSING

Registered nurses function in a variety of capacities within different employment settings. They are responsible for the nature and quality of all nursing care that patients receive in hospitals, nursing homes, doctors' offices and so forth. The majority of practicing registered nurses are responsible for carrying out the physicians' patient-care instructions and for supervising the more routine treatment activities performed by licensed practical nurses and nonprofessional personnel.

Estimates of the population per *employed* registered nurse ratios in Iowa and the United States for selected years are presented in Chart 1. The trend lines indicate that between 1962 and 1967 the number of employed registered nurses in Iowa and the United States increased faster than their respective resident populations. Between the years 1962 and 1967, Iowa's ratio of population per employed registered nurse changed from 311 to 256, representing an estimated drop of approximately 18 percent—or 55 less people per employed nurse. Over the same period, the population per employed registered nurse ratio for the United States declined about 10 percent, falling from 336 to 302.

Chart 1. Population per Employed Registered Nurse for Iowa for Selected Years



Source: See Appendix B, Table 1.

It is clear from Chart 1 that between 1962 and 1967, Iowa's population per employed registered nurse ratio was lower than the United States' ratio. Further, over this same period Iowa's position relative to the nation's has been improving. Note, however, that this should not be interpreted to mean that the per capita availability of nursing services is greater in Iowa than in the nation as a whole. The ratio of population per employed registered nurse is not an accurate measure of the availability of nursing services: the supply of nursing services is not directly proportional to the number of employed registered nurses; neither is the demand for nursing services proportional to the size of the population. The population per employed registered nurse ratios are used here to make comparisons, rather than to make an assessment of adequacy.

If data were available on the numbers of employed registered nurses in Iowa by region and county, ratios of population per employed registered nurse could then be computed for these geographic areas for comparison purposes. Unfortunately, such data on registered nurses are not readily available. However, information for December 1967 is available on the number of registered nurses living in Iowa with current or "active" licenses to practice nursing, by place of residence. These data were supplied by the Iowa Board of Nursing and were used in computing the population per active licensed registered nurse ratios for the various regions and counties in Iowa. (Appendix B, Table 2.) These ratios may be interpreted as "rough" approximations of the population per employed registered nurse ratio discussed above.

Before turning to the discussion of regional and county ratios of population per active licensed registered nurse in Iowa, some more general comments are presented which tend to put into clearer perspective the difference between the number of employed registered nurses vs. active licensed registered nurses. Table 1 presents summary information on the license status of Iowa-based registered nurses.

Table 1. Registered Nurses Residing in and Licensed by Iowa by License Status: December, 1967[a]

License Status	Number	Percent
Active	15,380	71.66
Inactive	4,169	19.42
Delinquent	1,915	8.92
Total	21,464	100.00

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[a] Basic data provided by the Iowa Board of Nursing.

This table shows that in December 1967 the state had files on 21,464 registered nurses living in Iowa. Among them, only 15,380 or 71.66 percent had active licenses to practice nursing.[1] However, while the state requires a registered nurse to have a current or active license in order to practice, this does not necessarily imply that the nurse will work.

Table 2 shows that only 10,791, or 70.16 percent, of the registered nurses with active licenses were employed in December 1967. Among the remaining, 4,512 were not employed and 77 had an unknown employment status.

Table 2. Registered Nurses with Active Licenses in Iowa Relative to the Population: December, 1967[a]

Total with Active Licenses to Practice	15,380
Employed	10,791
Not employed	4,512
Employment not Reported	77
Resident Population per Employed Registered Nurse	256
Resident Population per Active Licensed Registered Nurse[b]	179

[a] Basic data provided by the Iowa Board of Nursing.

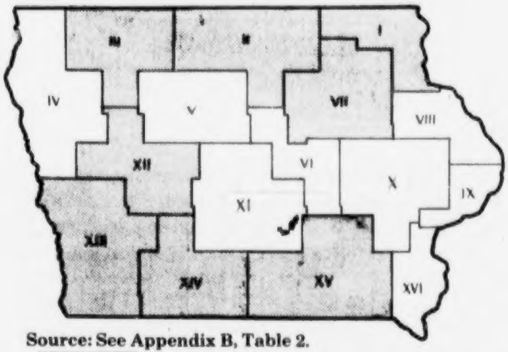
[b] U. S. Bureau of Census, *Statistical Abstract of the United States*, 1969, Washington, D. C.

The shading in Map 1 shows the regions in Iowa which had ratios of population per active licensed registered nurse which exceeded the comparable 1967 state ratio of 179. From region to region, the ratio varied from a high of 344 in Region XIV to a low of 131 in Region X. Exactly half of Iowa's 16 regions had population per active licensed registered nurse ratios that were lower than the state's in 1967.

Map 2 provides more detail. From county to county, there was considerable variation in population size and in the number of registered nurses with active licenses. The shaded areas similarly represent counties with ratios of population per active licensed registered nurse which exceeded the state ratio in 1967. These ratios ranged from a high of 591 in Allamakee county to a low of 65 in Johnson county. Only 24 counties had ratios lower than the state's 179 persons per active licensed registered nurse. Most of these counties were in the central, east central, and northwestern parts of the state.

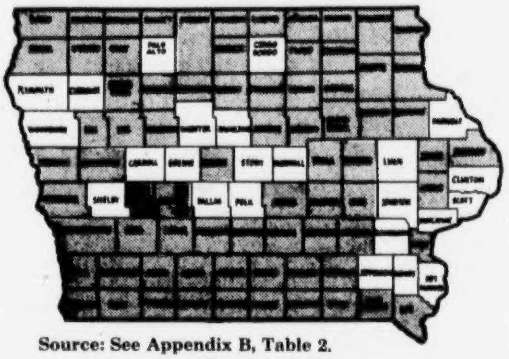
The non-shaded regions in Map 1 are, in large part, the same that have been experiencing considerable economic growth over the past few decades. Thus, relatively more of most goods and services per capita are thought to be available in these regions, including medical and nursing services. Rapid technological change in agriculture and the growth of new urban industries have resulted in new economic opportunities in these parts of Iowa, accounting for their growth in both population and economy.

Map 1. Population per Active Licensed Registered Nurse for Iowa by Region: 1967



Source: See Appendix B, Table 2.

Map 2. Population per Active Licensed Registered Nurse for Iowa by County: 1967



Source: See Appendix B, Table 2.

***Map with county identification of legible size on Page 91, Appendices Section.**

CHARACTERISTICS OF IOWA'S REGISTERED NURSES

This picture of registered nurses in Iowa is a broad one and hence does not provide information about many characteristics of Iowa's registered nurse profile that may be relevant to planning and decision-making in health care. For example, if hours of nursing service provided per week were used as a measure of nursing services available to Iowans, one would grossly overestimate the scope of service by merely multiplying the total number of employed registered nurses (Appendix B, Table 2) by, say, 40 hours of work per week. Many employed registered nurses work on a part-time basis.

To estimate the proportion of Iowa's registered nurses working full-time vs. part-time, and to present more complete information about certain characteristics of Iowa's stock of registered nurses, the results of a registered nurse study conducted by Mario F. Bognanno, Associate Director of The University of Iowa's Health Economics Research Project, are now described. The findings of this study represent the only complete set of data about Iowa's registered nurses.

The data collected by Bognanno were obtained from responses to a questionnaire sent to a randomly selected sample of registered nurses. This sample was drawn from a December 1967 listing of registered nurses provided by the Iowa Board of Nursing. This listing was sorted to exclude registered nurses who were (1) nonresidents of Iowa, (2) over 65 years of age, and (3) members of a religious order.

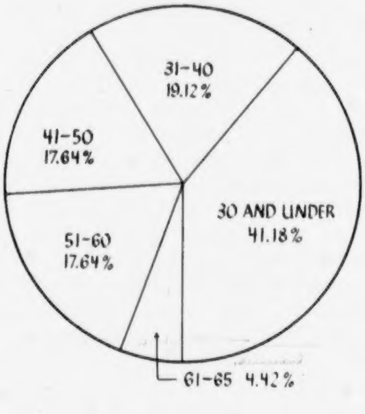
The resulting study population numbered about 16,000 female registered nurses, from which a stratified 10 per cent sample was drawn. The sample survey took place during August and September of 1968, and the response rate was estimated to be approximately 79 percent. The reader should keep in mind that the data reported from this sample survey relate only to the study population defined above.

Age and Marital Status

Chart 2 gives a visual impression of the distribution of Iowa's registered nurses by age groupings at the time of the sample survey. It was estimated that more than 29 percent of Iowa's registered nurses were between the age of 21 and 30, nearly 27 percent between 31 and 40 years of age, approximately 26 percent between 41 and 50; 14 and three percent respectively were in the 51-to-60 and 61-to-65 age groups. The mean age, using these grouped data, was approximately 39 in 1968.

At the time of the sample survey, a very large majority of Iowa's registered nurses were married. Chart 3 shows that an estimated 86 percent were married, eight percent were single, four percent widowed, two percent divorced, and less than one percent were separated.

Chart 2. Distribution of Registered Nurses for Iowa by Age: 1968



Source: See Appendix B, Table 3.

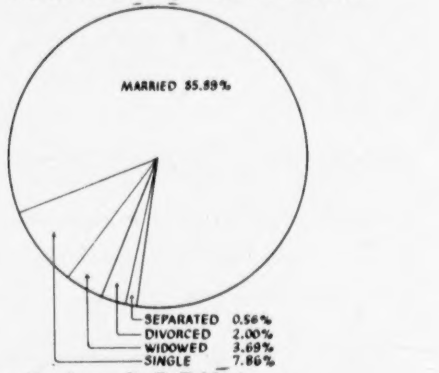
Basic Education

The educational preparation of Iowa's registered nurses, like that of registered nurses the nation over, took place largely in hospital schools. Chart 4 shows that an estimated 89 percent of the state's registered nurses graduated from hospital diploma programs. About six percent were trained in baccalaureate degree programs, approximately 2.5 percent in associate degree programs, and the remaining 2.5 percent received their basic training in combination programs. Interestingly enough, it was discovered that nearly 75 percent of the state's registered nurses were trained in Iowa; only 25 percent received training in some other state or foreign country.

Employment Status

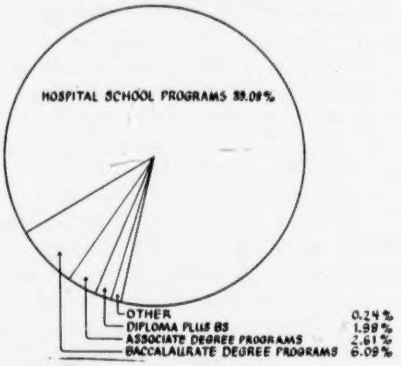
Table 3 shows that among the nearly 16,000 registered nurses in Bognanno's study population, an estimated 62.03 percent were practicing nursing during August-September of 1968. This implies that nearly 11,000 registered nurses were employed during the sampling period. It is important to repeat, however, that not all of the employed registered nurses were working full-time.

Chart 3. Percentage Distribution of Registered Nurses for Iowa by Marital Status: 1968



Source: See Appendix B, Table 4.

Chart 4. Distribution of Registered Nurses for Iowa by Education Program: 1968



Source: See Appendix B, Table 5.

Table 3. Employment Status of Iowa's Registered Nurses: August-September, 1968[a]

	Employed as Nurses	Not Employed	Not Reporting[b]
Percent	62.03	39.97	—
Standard Error	1.37	1.37	—
Cell Size	784	480	9

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who failed to report their employment status.

Table 4 presents a more detailed set of estimates as to the type of work commitments that involved Iowa's registered nurses in 1968. An estimated 34.25 percent of Iowa's registered nurses were employed full-time, about 28 percent were working on either an irregular or regular part-time basis, and almost 38 percent were not practicing nursing at all.

Table 4. Detailed Employment Status of Iowa's Registered Nurses: August-September, 1968[a]

	Percent	Standard Error	Cell Size
Regular Full-Time[b]	33.54	1.33	424
Full-Time Private Duty[b]	.71	.24	9
Regular Part-Time[c]	23.42	1.19	296
Irregular Basis[d]	4.35	.57	55
Not Employed	37.97	1.37	480
Not Reporting[e]	—	—	9

---

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Regularly scheduled work of 40 or more hours per week.

[c] Regularly scheduled work of less than 40 hours per week.

[d] No regular scheduling of hours worked per week.

[e] Number of respondents to the sample survey who failed to report their employment status.

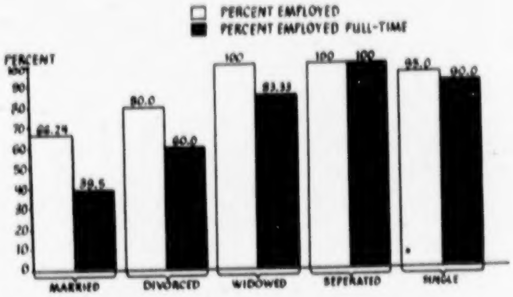
EMPLOYMENT BY MARITAL STATUS: Chart 5 presents by marital status the percentages of Iowa's registered nurses who were employed (either full-time or part-time) and the percentage who were employed on a full-time basis. While slightly more than 58 percent of Iowa's married nurses were employed, only about half of them worked on a full-time basis. Relatively much larger percentages of divorced, widowed, separated, and single registered nurses were employed, and these nurses mostly worked full-time. This comparison has particular relevance to the availability of registered nursing services to Iowans since it has been estimated that more than four out of five of Iowa's registered nurses were married at the time of the sample survey.

EMPLOYMENT BY AGE DISTRIBUTION: Chart 6 is very helpful in showing how the percentages of employed registered nurses vary by age category. The most striking feature in Chart 6 is the wide cyclical variation in the percentage of employed from one age category to another. The highest percentages variously employed (full-time and part-time) and employed full-time are found among the youngest—those 25 and under—in which group an estimated 75.17 and 51.01 percent, respectively, were working.

There was a sharp drop, particularly among those employed full-time, in the percentages working after this age category. Starting with the 36-40 age group, the percentages increase until the age of 56 is reached. After this age, the percentage of employed registered nurses declines steadily until retirement age arrives.

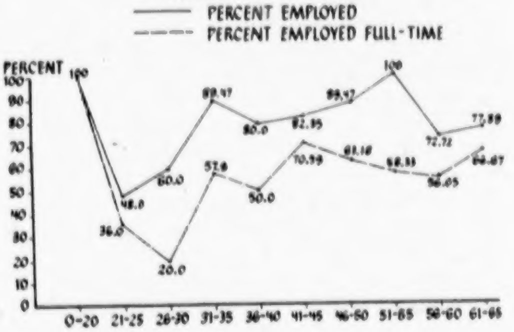
The cycle exhibited in Chart 6 is often referred to as the "life-cycle" pattern, and it prevails in these data because of the predominance of married registered nurses in Iowa. Most registered nurses work for a time shortly after graduation, leave nursing during the child-bearing and rearing phase of their life-cycle, then subsequently return to practice for a number of years before retiring.

Chart 5. Labor Market Participation of Registered Nurses for Iowa by Marital Status: 1968



Source: See Appendix B, Table 6.

Chart 6. Labor Market Participation of Registered Nurses for Iowa by Age Category: 1968



Source: See Appendix B, Table 7.

EMPLOYMENT SETTING: Tables 5 and 6 show how Iowa's employed registered nurses were distributed by field and position of employment, respectively.

Table 5. Percentage Distribution of Iowa's Employed Registered Nurses by Field of Employment: August-September, 1968[a]

Field	Percent	Standard Error	Cell Size
Hospital	62.63	1.73	491
Nursing Home	7.78	.96	61
School of Nursing	3.44	.65	27
Private Duty	2.30	.53	18
Public Health	3.06	.61	24
School Nurse	5.36	.81	42
Industrial Nurse	1.40	.42	11
Office Nurse	10.33	1.09	81
Other	3.70	.67	29

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

Table 5 reveals that a large majority, nearly 63 percent, of Iowa's employed registered nurses were engaged in hospital nursing. Office nursing ran a distant second with slightly more than 10 percent.

With respect to position, Table 6 reveals that nearly 46 percent of Iowa's employed registered nurses worked as general duty or staff nurses, approximately 15 percent held positions as head nurse or assistant head nurse, nearly 11 percent worked as office nurses, and about eight percent were supervisors or assistant supervisors. About 80 percent of Iowa's employed registered nurses held one of these four positions.

Table 6. Percentage Distribution of Iowa's Employed Registered Nurses by Type of Position: August-September, 1968[a]

Position	Percent	Standard Error	Cell Size
Director or Assistant	4.60	.74	36
Consultant	.39	.22	3
Supervisor or Assistant	8.29	.99	65
Instructor or Faculty Member	4.60	.75	36
Head Nurse or Assistant	15.31	1.29	120
General Duty or Staff	45.54	1.78	357
Office Nurse	10.59	1.10	83
Other	10.59	1.10	83
Not Reporting[b]	—	—	1

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who reported employment status, but failed to report position of employment.

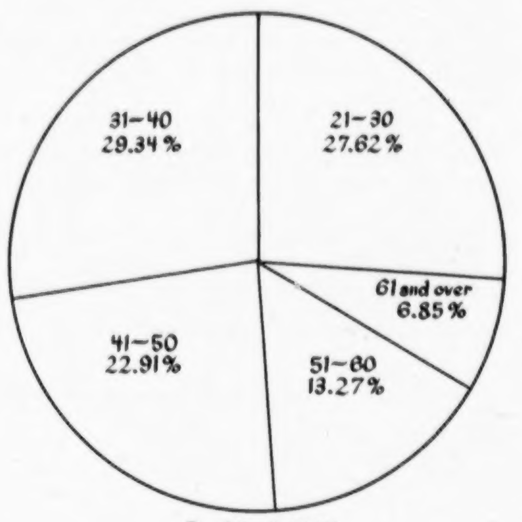
INACTIVE REGISTERED NURSES

A casual inspection of Table 4 should leave little doubt that there was a large stock of inactive registered nurses in Iowa at the time of the survey, and that their return to practice would have a considerable impact on the supply of nursing services available to the state's citizens. Based on the data presented in Table 4, it was estimated that if all the registered nurses then employed part-time (assumed to be 20 hours per week), and all who were not working at all had been working a 40-hour week, the number of professional nursing service hours available to Iowans would have been increased by approximately 330,000 per week.

Age and Marital Status

The majority of Iowa's inactive registered nurses are young, married women. More than two-thirds of the state's inactive registered nurses were age 45 or younger (see Chart 7), and almost 95 percent were married (see Chart 8). Consequently, it is not surprising that an estimated 81 percent of Iowa's inactive, married registered nurses had children "living at home," and that the estimated average age of these children was approximately nine years. It was also found that 51 percent of the state's inactive, married registered nurses had at least one child under six years of age.

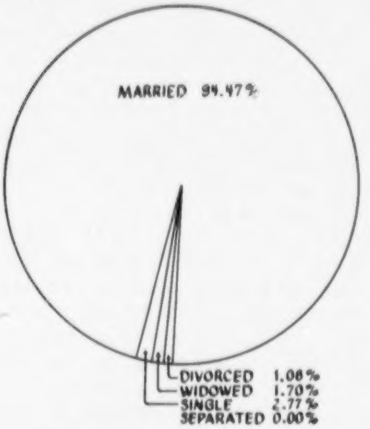
Chart 7. Distribution of Inactive Registered Nurses for Iowa by Age: 1968



Source: See Appendix B, Table 8.

Since there has been much concern in Iowa over registered nurse shortages, it would seem highly practical to treat this pool of young, inactive registered nurses as a potential source of nursing services for the future. The problem, of course, is to find ways to recruit from this standing reserve large numbers of nurses than would otherwise return to practice.

Chart 8. Distribution of Inactive Registered Nurses for Iowa by Marital Status: 1968



Source: See Appendix B, Table 9.

Plans for the Future

The inactive registered nurses in the sample survey were asked to indicate their future work plans. Based on their replies, it was estimated that nearly 39 percent of Iowa's inactive registered nurses planned to return to practice in the near future. Chart 9, indicated that an equal percentage were undecided about their future work plans as nurses and slightly more than 22 per cent did not plan to return to nursing.

Desired Scheduling of Hours

Table 7 shows that nearly 82 percent of Iowa's registered nurses who planned to return to nursing will be searching for "part-time" employment.

Table 7. Percentage of Iowa's Inactive Registered Nurses who Plan to Return to Nursing on a Full-Time or Part-Time Basis: August-September, 1968 [a]

	Full-Time	Part-Time	Not Reporting [b]
Percent	18.07	81.93	—
Standard Error	3.00	3.00	—
Cell Size	30	136	9

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who were inactive, planned to return to nursing, but who failed to report whether on a full-time or part-time basis.

Table 8. Age Distribution of Iowa's Inactive Registered Nurses: August-September, 1968 [a]

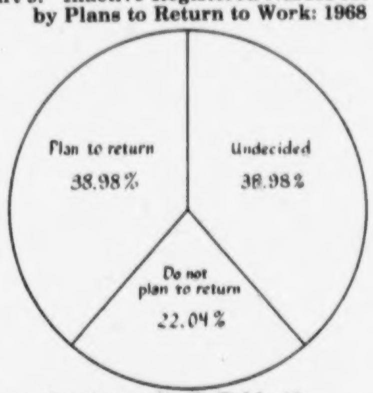
Age [b]	Percentage	Standard Error	Cell Size
25 and Under	7.92	1.25	37
26-30	19.70	1.84	92
31-35	16.49	1.72	77
36-40	12.85	1.55	60
41-45	14.56	1.63	68
46-50	8.35	1.28	39
51-55	6.21	1.12	29
56-60	7.06	1.15	33
61-65	5.14	1.02	24
Over 65	1.71	.60	8
Not Reporting [c]	—	—	13

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] The age variable was calculated by taking the difference between the year of graduation from basic nursing education and 1968 plus 21.

[c] Number of respondents to the sample survey who reported that they were not employed, but failed to report the year they graduated from basic nursing education program.

Chart 9. Inactive Registered Nurses for Iowa by Plans to Return to Work: 1968



Source: See Appendix B, Table 10.

SUMMARY

The characteristics of the population of registered nurses analyzed above may now be summarized. Iowa's registered nurses were: (1) predominately young (mean age of 39) and married (86 percent); (2) predominately educated in hospital diploma programs (89 percent); and (3) employed as nurses (62 percent).

The typical employed registered nurse in Iowa was (1) hospital based (63 percent), and (2) more likely than not worked as a general duty or staff nurse (46 percent). The vast majority of inactive registered nurses were (1) young women (more than 75 percent age 45 or under), and (2) married (95 percent). Among the inactive registered nurses in Iowa at the time of the sample survey, nearly 39 percent planned to return to nursing sometime in the near future.

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[1] Of course, at this time, there may have been registered nurses living in Iowa who have never held an Iowa license to practice nursing. These nurses would not be accounted for in Table 1.

PRACTICAL NURSING

Practical nurses provide nursing care and treatment of patients under the supervision of a registered nurse. They are trained to utilize skilled and safe techniques in performing nursing procedures.

Data on licensed practical nurses at the national level are very sketchy. Consequently it would be meaningless to compare trend information on the population per licensed practical nurse in Iowa with that of the United States. However, data are available on practical nurses licensed by the state of Iowa.

This state legally requires that a person must become licensed as a practical nurse in order to be employed as a practical nurse. Iowa also keeps a file on all practical nurses licensed by the state, whether their licenses are current or "active" or not.

The summary information presented in Table 1 is based on data supplied by the Iowa Board of Nursing. This table shows that in December 1967 there was a population of 4,595 practical nurses residing in Iowa who had been licensed by the state. At that time, however, there were only 3,640 practical nurses in Iowa with active licenses.

Table 1. Practical Nurses Residing in and Licensed by Iowa by License Status: December, 1967[a]

License Status	Number	Percent
Active	3,640	79.22
Inactive	567	12.34
Delinquent	388	8.44
Total	4,595	100.00

[a] Basic data provided by the Iowa Board of Nursing.

Table 2 shows that 2,811, or 77.22 percent, of the practical nurses with active licenses were employed. That left 802 practical nurses with active licenses who were not employed, and 27 with current licenses whose employment status was not known. Based on the number of practical nurses who had active licenses and reported their employment status, it was estimated that there were 982 persons per *employed* licensed practical nurse in Iowa in 1967.

Table 2. Practical Nurses With Active Licenses, in Relation to the Population: December, 1967

Iowa	
Total with Active Licenses to Practice[a]	3,640
Employed	2,811
Not Employed	802
Employment not Reported	27
Resident Population per Employed Licensed Practical Nurse[b]	982

[a] Basic data provided by the Iowa Board of Nursing.

[b] Iowa's 1967 population estimate was taken from the U.S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, D. C.

While it would be interesting to compare the state's ratio of population per *employed* licensed practical nurse with those of separate regions and counties in Iowa, employment data on licensed practical nurses are not readily available for those geographic areas. Geographic information for 1967 is, however, available on licensed practical nurses with active licenses, and corresponding ratios were computed using these data. (See Appendix C, Table 1).

The shaded multi-county regions in Map 1 show such regions in Iowa as in 1967 had ratios of population per active licensed practical nurse that exceeded the state ratio of 756. These ratios varied from a high of 1,317 in Region III to a low of 577 in Region XV. Exactly one-half of the 16 regions in Map 1 had a ratio of population per active licensed practical nurse that was lower than the state's in 1967.

The population size and the number of licensed practical nurses with active licenses varied considerably from county to county. The shaded counties in Map 2 represent those which had 1967 population per active licensed practical nurse ratios that exceeded the state ratio of 756. County by county, the ratios ranged from 2,333 in Adair to 412 in both Fremont and Taylor.

Only 29 counties had ratios lower than that for the state's. It is interesting to observe that Iowa's two southernmost tiers of counties compare quite favorable relative to other counties in the state in this respect.

CHARACTERISTICS OF IOWA'S LICENSED PRACTICAL NURSES

One important by-product of the 1968 registered nurse study conducted by Mario F. Bognanno and the staff of the University of Iowa's Health Economics Research Center was a random sample of Iowa's licensed practical nurses that was surveyed along with registered nurses. The licensed practical nurse sample was drawn from a December 1967 listing of practical nurses provided by the Iowa Board of Nurses.

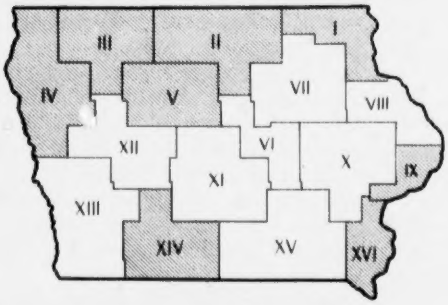
This listing was sorted to exclude from the study population those practical nurses who were (1) nonresidents of Iowa, (2) over 65 years of age, and (3) members of a religious order. The resulting study population numbered about 3,300 female practical nurses. The sample survey of licensed practical nurses took place during August and September of 1968, and the response rate was estimated at 67 percent.

The remaining parts of this section will describe the findings of this survey, which represent the only complete set of data on significant characteristics of Iowa's licensed practical nurses. However, the reader should keep in mind that the following discussion relates only to the study population defined above.

Age and Marital Status

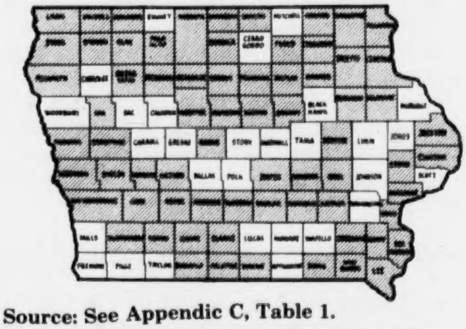
The mean age of the licensed practical nurse in the study population was estimated at about 38. Chart 1 presents the age distribution of Iowa's licensed practical nurses. It was found that slightly more than 41 percent of the study population was in the age bracket of 30 years or younger.

Map 1. Population per Active Licensed Practical Nurse for Iowa by Region: 1967



Source: See Appendix C, Table 1.

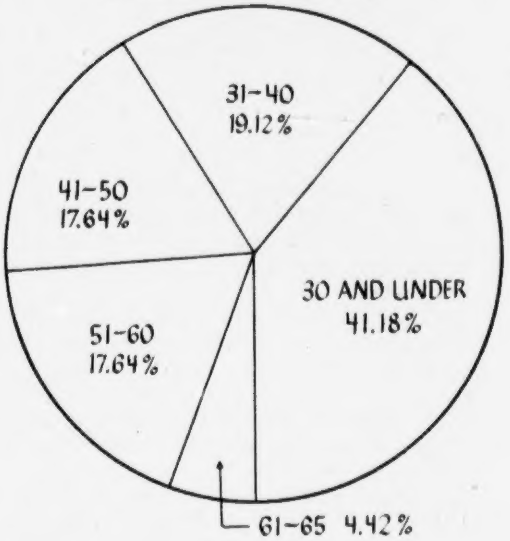
Map 2. Population per Active Licensed Practical Nurse for Iowa by County: 1967



Source: See Appendic C, Table 1.

*Map with county identifications of legible size on Page 91, Appendices Section.

Chart 1. Distribution of Licensed Practical Nurses in Iowa by Age: 1968



Source: See Appendix C, Table 2.

An estimated 19 percent of the nurses were between the ages of 31 and 40, approximately 18 percent were in the 41-to-50 and 51-to-60 age categories, and about four percent were between 61 and 65 years old.

In examining the marital status of Iowa's licensed practical nurses, it was found that a large majority were married at the time of the sample survey. Chart 2 shows that an estimated 77 percent of Iowa's licensed practical nurses were married, almost 10 percent were single, seven percent were divorced, nearly three percent were widowed, and two percent were separated.

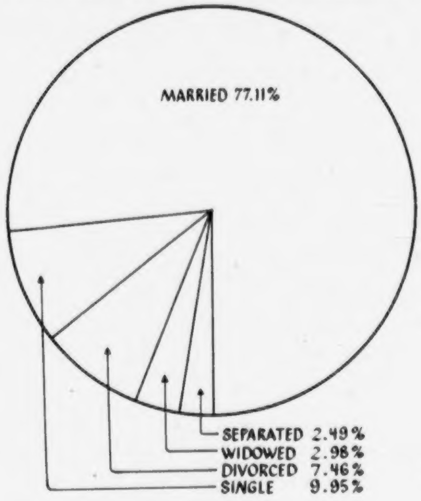
Basic Education

Data on the type of educational programs from which Iowa's licensed practical nurses received their basic education were not forthcoming from Bognanno's sample survey. However, it was learned that an estimated 86.77 percent of the study population were trained in Iowa and the remaining 13.23 percent in some other state or a foreign country. One might assume that most of the state's practical nurses were trained in state-approved hospital or community college programs.

Employment Status

Table 3 shows that of the nearly 3,300 licensed practical nurses in the sample, an estimated 72 percent were employed during August-September, 1968. This implies that approximately 2,300 in the study population were employed during the sampling period. However, it is important to note that not all of the employed practical nurses were working on a full-time basis.

Chart 2. Distribution of Licensed Practical Nurses for Iowa by Marital Status: 1968



Source: See Appendix C, Table 3.

Table 3. Employment Status of Iowa's Licensed Practical Nurses: August-September, 1968 [a]

	Employed as Nurse	Not Employed	Not Reporting[b]
Percent	71.93	28.07	0
Standard Error	3.16	3.16	0
Cell Size	146	57	1

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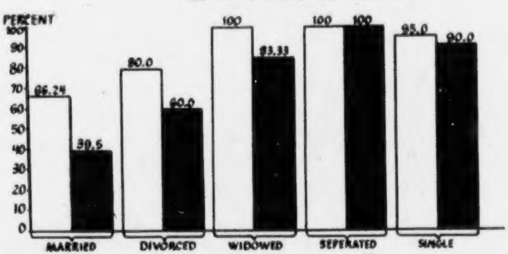
[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who failed to report their employment status.

Table 4 presents in more detail estimates regarding work commitments of Iowa's licensed practical nurses in 1968. It was estimated that slightly more than 50 percent were employed full-time, about 22 percent either on an irregular basis or on a regular part-time basis, and 28 percent were not practicing at all.

Chart 3. Labor Market Participation Rates for Licensed Practical Nurses for Iowa by Marital Status: 1968



Source: See Appendix C, Table 4.

Table 4. Detailed Employment Status of Iowa's Licensed Practical Nurses: August-September, 1968 [a]

	Percent	Standard Error	Cell Size
Regular Full-Time[b]	48.76	3.52	99
Full-Time Private Duty[b]	1.48	.85	3
Regular Part-Time[c]	20.20	2.82	41
Irregular Basis[d]	1.48	.85	3
Not Employed	28.08	3.16	57
Not Reporting[e]	---	---	1

---

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Regularly scheduled work of 40 or more hours per week.

[c] Regularly scheduled work of less than 40 hours per week.

[d] No regular scheduling of hours worked per week.

[e] Number of respondents to the sample survey who failed to report their employment status.

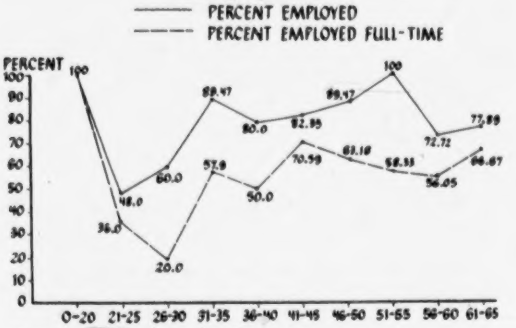
EMPLOYMENT BY MARITAL STATUS: Chart 3 presents a visual impression of the percentage of Iowa's licensed practical nurses who were employed (either full-time or part-time); also the percentage employed full-time, by marital status. It can be seen from this chart that most of the state's divorced, widowed, separated, and single practical nurses were employed at the time of the sample survey, and that most of these women worked on a full-time basis.

These findings stand in a sharp contrast with the labor market participation rate for married practical nurses. While it was estimated that about 66 percent of the latter were employed, only 40 percent of them were working full-time. Since an estimated three out of four of the licensed practical nurses in the study population were married, the fact that such a large proportion of these were not working has particular relevance to the supply of practical nursing services in Iowa.

EMPLOYMENT BY AGE DISTRIBUTION: Chart 4 was designed to show the marked variation in percentages of Iowa's employed licensed practical nurses divided into age categories. The highest percentages of those employed in licensed practical nursing (full-time and part-time) and employed full-time are found among the youngest, those 20 and under, in which category an estimated 100 percent were working. Particularly among the full-time employed, there was a drop in the percentage working after this age group. Starting with the 26-30 group, the percentage employed again increased until the age of 55 was reached.

A pattern of employment, largely controlled by the high proportion of married practical nurses in Iowa, emerged from these data. Most licensed practical nurses work in this field for a time shortly after graduation, leave it during the usual child-bearing and rearing ages, then return to practice subsequent to that time.

Chart 4. Labor Market Participation Rates for Licensed Practical Nurses for Iowa by Age Category: 1968



Source: See Appendix C, Table 5.

EMPLOYMENT SETTING: The distribution of employed licensed practical nurses by field of employment is presented in Table 5. These data indicate that more than half of Iowa's employed practical nurses worked in hospitals at the time of the sample survey. It was estimated that about one-fourth worked in nursing homes, and the other one-fourth was distributed among the remaining employment settings—such as physicians' or dentists' offices and private homes.

Table 5. Percentage Distribution of Iowa's Employed Licensed Practical Nurses by Field of Employment: August-September, 1968[a]

Field	Per-cent	Standard Error	Cell Size
Hospital	56.38	3.48	115
Nursing Home	24.51	3.02	50
Private Duty	2.94	1.19	6
Office	6.86	1.77	14
Other	9.31	2.04	19

[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

INACTIVE LICENSED PRACTICAL NURSES

The statistics in Table 4 (preceding) imply that a relatively large stock of inactive practical nurses resided in Iowa at the time of Bognanno's sample survey. Based on these estimates, it was calculated that if all of the licensed practical nurses employed on a regular part-time basis (assumed to be 20 hours per week), and all not working at all had been working a 40-hour week, the hours of practical nursing services available to Iowans would have been increased by approximately 51,000 per week.

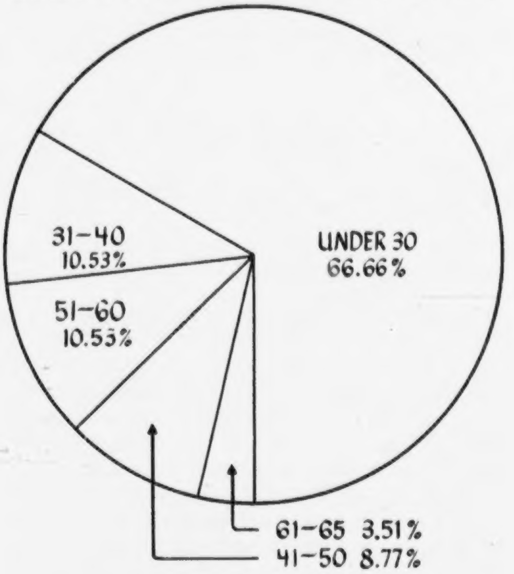
Age and Marital Status

Iowa's inactive licensed practical nurses as a group were largely young, married women. Chart 5 shows that by estimate nearly 67 percent of Iowa's inactive practical nurses in 1968 were under 30 years of age, with an estimated mean age of approximately 32 years old. Further, as shown in Chart 6, an estimated 93 percent of the study population's inactive practical nurses were married.

In light of these findings, it is not surprising that an estimated 72 percent of Iowa's inactive married nurses had children "living at home," and that the average age of these children was estimated at approximately six years. Similarly, it was learned that about 52 percent of the state's inactive married practical nurses had at least one child under six years of age.

In view of the practical nurse shortage, there is a tendency to regard inactive licensed practical nurses as a potential source of practical nursing supply. Since the bulk of Iowa's inactive practical nurses are relatively young and married, it is logical to think that a portion of this group may return to work in the future. Efforts to recruit from this inactive pool should be considered.

Chart 5. Distribution of Inactive Licensed Practical Nurses for Iowa by Age: 1968



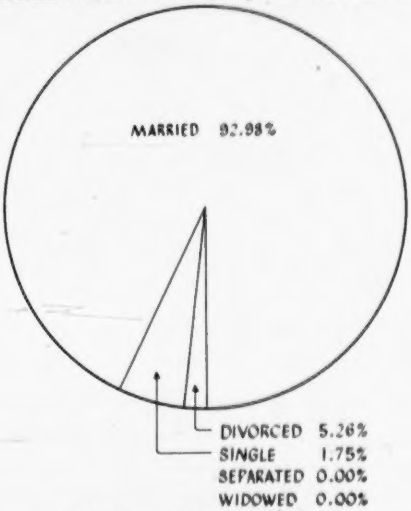
Source: See Appendix C, Table 6.

Plans for the Future

The inactive licensed practical nurses in the sample survey were asked to indicate their future work plans. Based on the replies, it was estimated that nearly 38 percent planned to return to work in the near future. Chart 7 shows that about nine percent did not plan to return to work, and 54 percent were undecided about their future employment plans.

DESIRED SCHEDULING OF HOURS: Table 6 indicates that slightly more than 84 percent of the inactive practical nurses in Iowa who planned to return to work in the future will be searching for part-time jobs.

Chart 6. Distribution of Inactive Licensed Practical Nurses for Iowa by Marital Status: 1968

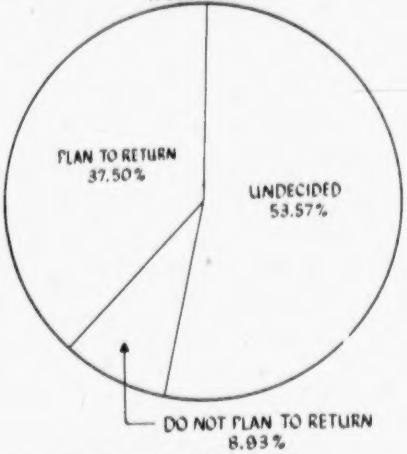


Source: See Appendix C, Table 7.

Table 6. Percentage of Iowa's Inactive Licensed Practical Nurses who Plan to Return to Nursing on a Full-Time and Part-Time Basis: August-September, 1968[a]

	Full-Time	Part-Time	Not Reporting[b]
Percent	15.79	84.21	—
Standard Error	8.59	8.59	—
Cell Size	3	16	2

Chart 7. Distribution of Inactive Licensed Practical Nurses for Iowa by Plans to Return to Work: 1968



Source: See Appendix C, Table 3.

SUMMARY

To summarize, at the time of the survey Iowa's licensed practical nurses were: (1) predominately young (mean age of 38) and married (77 percent); (2) educated in Iowa-based licensed practical nursing programs (nearly 87 percent), and (3) employed as practical nurses (72 percent). The typical employed licensed practical nurse in Iowa worked in a hospital (56 percent).

The majority of inactive licensed practical nurses were: (1) young women (nearly 67 percent 30 years of age or younger), and (2) married (93 per cent). Among the inactive licensed practical nurses in Iowa at the time of the sample survey, nearly 39 percent planned to return to nursing some time in the near future.

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents in the sample survey who were inactive, planned to return to nursing, but who failed to report whether on a full-time or part-time basis.

DENTISTRY

The maintenance of general health includes the treatment and prevention of tooth decay, disease of the mouth, and other oral disorders. Doctors of dentistry play the key role in the production of dental care. Besides providing services which improve the health of the teeth and related structures, they also coordinate the health care services proviced by auxiliary dental personnel.

It would be ideal to have detailed information regarding the number, tasks and productivity of Iowa dentists for purpose of estimating the supply of dental services available to Iowans. However, such information is simply not available in a form suitable for analysis. For instance, the "typical" dentist's productivity is dependent on factors such as education, skills, hours worked, capital equipment, auxiliary personnel, business organization and other variables. A question without a ready answer, however, is: What is the technical relationship between the productivity of dentists and all of the above mentioned factors?

With only limited knowledge available about the productivity of Iowa dentists, and even less knowledge about the structure of demand for dental care, the task undertaken in this section has to be regarded as somewhat modest. Nevertheless, herein are assembled some salient facts about the characteristics of Iowa dentists which will, hopefully, represent a first step toward a more complete and detailed analysis.

Particular caution should be taken in drawing conclusions regarding trends suggested by the dental data when based on too brief a span of years to assure accuracy.

CHARACTERISTICS OF IOWA DENTISTS

Population to Dentist Ratios

In 1968, Iowa had 1,499 resident dentists who were licensed to practice. Of these, 1,252 were in private practice either on a full-time or part-time basis. Table 1 shows that 119 of the remainder were retired but maintained a current license to practice, 57 were in the military or practicing full-time in some institutional capacity, 31 were in graduate studies, and 40 were faculty members at the University of Iowa College of Dentistry.

These figures are more meaningful when related to Iowa's indigenous population, and then compared with the past. In 1968, the ratio of population per active dentist in Iowa was 1,994, which was considerably lower than comparable ratios estimated for the years 1960 and 1965.[1] Chart 1 provides an even broader perspective.

Table 1. Iowa Dentists by Activity Status: July, 1968

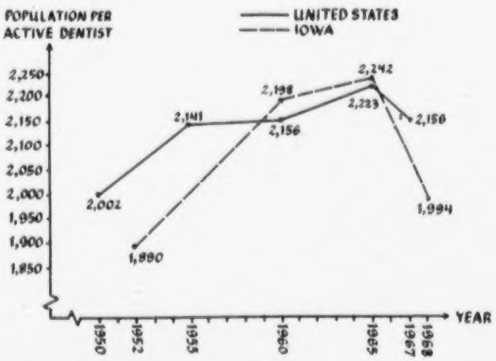
Activity	Number
Total	1,499
Private Practice	1,252
Full-time (1,153)	
Part-time (99)	
Retired	119
Military or Institutional	57
Graduate Students	31
Dental College Faculty	40

A Profile of Iowa Dentists—1968 (Unpublished paper provided by the Dental Health Division of the Iowa State Department of Health), p. 5.

The population per active dentist trend for the United States indicates that between 1950 and 1967 the ratio increased until 1965, when it reached a maximum for the period, and then it began to fall. Similarly, the population per active dentist trend in Iowa increased from 1952 until it reached a maximum in 1965, and subsequently began to decline. These trends reveal that during the latter half of the 1960's, the number of active dentists in Iowa and in the United States was increasing relative to the respective populations.

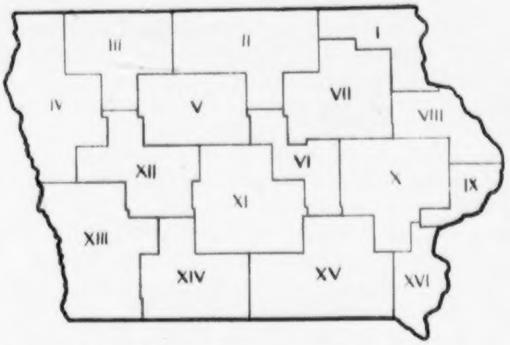
In spite of the fact that the estimated annual average increase in active dentists nationally exceeds Iowa's increase, most estimates of the

Chart 1. Population per Active Dentist for Iowa and U.S. for Selected Years



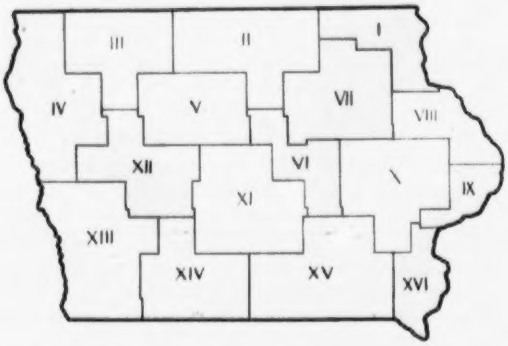
Source: See Appendix D, Table 1.

Map 1. Population per Active Dentist for Iowa by Region: 1965



Source: See Appendix D, Table 2.

Map 2. Population per Active Dentist for Iowa by Region: 1968



Source: See Appendix D, Table 2.

state's annual average population increments indicate negative changes as opposed to positive changes for the nation's population. For this reason, Iowa's population-per-dentist trend compares favorably to the nation's trend.

Geographic Distribution of Dentists in Iowa

There is considerable geographic variation in the ratios of population per active dentist from region-to-region and county-to-county in Iowa, which is not touched upon in the above discussion. Maps 1 and 2 show how the ratios for Iowa's 16 multi-county regions compare with the state's ratio for the years 1965 and 1968, respectively. As shown on Chart 1, the 1965 population per active dentist ratio in Iowa was 2,242 and in 1968 it was 1,994.

The seven non-shaded regions in Map 1 had ratios in 1965 which were lower than the state's ratio of 2,242 persons per active dentist. By 1968 the state ratio had declined to 1,994, implying that relative to 1965 there were fewer persons per active dentist in the state. However, this relative improvement was not uniformly distributed across regions or counties.

An inspection of Table 2, Appendix D, reveals that on an area basis Regions IV and XVI had fewer persons per active dentist in 1965 than in 1968. In fact, while the ratios for these two regions compared favorably to the 1965 state ratio (see Map 1), they were above the state ratio by 1968 (see Map 2).

The data underlying Maps 3 and 4 show considerable diversity in the population per active dentist ratio between counties for the years 1965 and 1968 (see Table 2, Appendix D). According to Map 3, some 32 Iowa counties (non-shaded) had ratios below the state's of 2,242 persons per active dentist. In 1968, only 27 counties had ratios below the state's 1,994.

A low (high) county ratio relative to some point in time, or to another geographic area, does not necessarily imply a relative surplus (shortage) of dental services. In fact, the county with a low ratio may actually be experiencing a shortage. Further, the reader should note that a stable balance may exist even though the relationship between the population and the number of active dentists may change.

Consequently, caution must be exercised in drawing hard and fast conclusions regarding shortages or surpluses of dental services based on limited information. For example, just because Johnson County had a 1968 ratio of 618 persons per active dentist—the lowest in the state—does not imply a "better" market position than, say, Linn county, which had a ratio of 1,567.

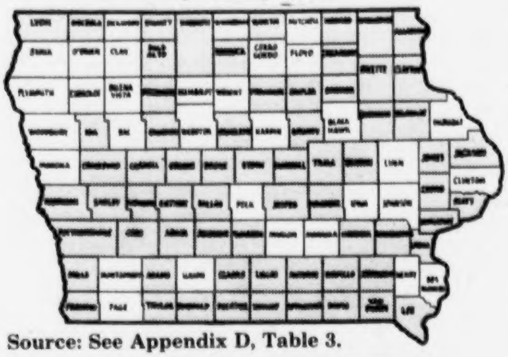
First, Johnson county contains the state's College of Dentistry, which provides a broad range of services to patients throughout Iowa; second, many of Johnson's "active" dentists allocate a large proportion of their time to teaching, rather than to patient care activities; and third, there is no reason to believe that the structure of demand, productivity, business organization, and so forth are the same in Linn and Johnson counties.

A study of the factors which explain the geographic distribution of dentists for Iowa by county was recently completed by Jerald L. Brown. It found that in addition to population, variables such as income or retail sales, fluoridation, and the age and sex distribution of the county population also play significant roles in explaining the geographic distribution of Iowa's dentists.[2]

These added variables, the same as population size, are unquestionably important in determining a county's demand for dental services. And it is understandable that relatively more active dentists locate where the relative demand for their services is greatest.

Table 2 provides detailed information on population in relation to the number of active dentists in Iowa according to county groupings. These groupings are based on the size of the

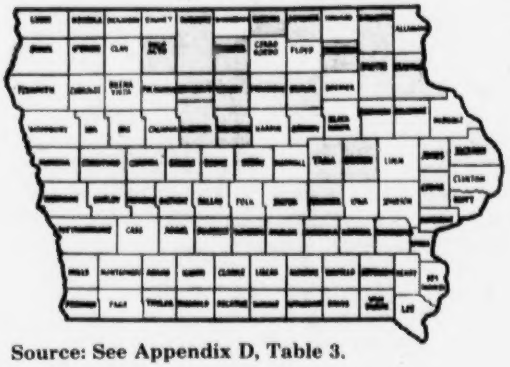
Map 3. Population per Active Dentist for Iowa by County: 1965



Source: See Appendix D, Table 3.

*Map with county identifications of legible size on Page 91, Appendices Section.

Map 4. Population per Active Dentist for Iowa by County: 1968



Source: See Appendix D, Table 3.

*Map with county identifications of legible size on Page 91, Appendices Section.

largest city in each county. In each of the years 1960, 1965, and 1968, the ratios of population per active dentist were lower for the "all metropolitan" group of counties, than for the "all non-metropolitan" group.

It should be noted, however, that the state's overall gain in active dentists per capita between 1965 and 1968 was geographically distributed in such a way that the "gap" between the metropolitan versus non-metropolitan ratios was closed somewhat.

It was estimated that in 1965 there were 396 more persons per active dentist in the "all non-metropolitan" county group than in the "all metropolitan" county group. By 1968, this difference declined from 396 to an estimated 292 persons. The "all non-metropolitan" counties lost more of their inhabitants, and gained more active dentists—in absolute terms—than did the "all metropolitan" counties between 1965 and 1968.

Finally, it is not surprising to note relative to counties having central cities of less than 50,000 that as the central city size declines, the population per active dentist ratio rises. This fact appears in both cross-section and time-series data as Table 2 reveals.

Age Composition of Dentists in Iowa

The age distribution of Iowa dentists as a total group and by region or county is an important variable in evaluating the state's present and future dental manpower position. In 1968, the mean age of Iowa's dentist population was slightly over 49 years of age. From region-to-region and county-to-county, however, the mean age varies considerably. The significance of this variation is clear.

Table 2. Iowa's Population per Active Dentists Ratio by County Group: 1960, 1965 and 1968

County Group	Total Active Dentists 1960[a]	1965[b]	1968[c]	1960	Population 1965	1967	Population per Active Dentist 1960	1965	1967/8
All Metropolitan Counties	**480**	**489**	**523**	**895,283**	**977,900**		**1,865**	**2,000**	**1,813**
Dubuque	41	51	53	66,132	84,000	88,120	1,988	1,647	1,663
Polk	165	153	168	262,698	286,300	272,810	1,592	1,871	1,624
Linn	70	78	93	133,359	148,500	145,720	1,839	1,904	1,567
Woodbury	54	56	54	108,315	110,200	105,650	2,006	1,968	1,957
Blackhawk	61	60	61	121,622	131,100	125,360	1,994	2,185	2,055
Scott	61	57	62	118,737	128,900	126,010	1,931	2,261	2,032
Pottawattamie	28	34	32	84,420	88,900	84,510	2,962	2,615	2,641
All Non-Metropolitan Counties	**751**	**768**	**857**	**1,810,101**	**1,840,400**	**1,803,820**	**2,410**	**2,396**	**2,105**
Central City Size:									
10,000-49,999	239	295	335	539,705	562,200	558,060	2,156	1,906	1,666
5,000- 9,999	241	226	259	551,108	559,900	546,920	2,339	2,477	2,112
2,500- 4,999	196	169	184	471,716	474,400	462,200	2,406	2,807	2,512
Under 2,500	75	78	79	247,572	243,900	236,640	3,633	3,127	2,995
Total	**1,231**	**1,257**	**1,380**	**2,705,387**	**2,818,300**	**2,752,000**	**2,198**	**1,242**	**1,994**

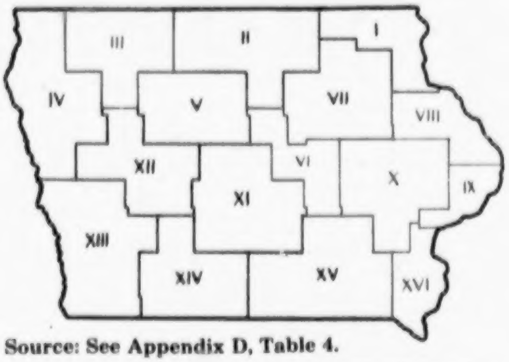
[a] Dental Health Division, Iowa State Department of Health.

[b] *1965 Survey of Dentists Licensed in Iowa* Iowa State Board of Dental Examiners and American Association of Dental Examiners.

[c] *A Profile of Iowa Dentists: 1968* (unpublished paper provided by the Dental Health Division, Iowa State Department of Health).

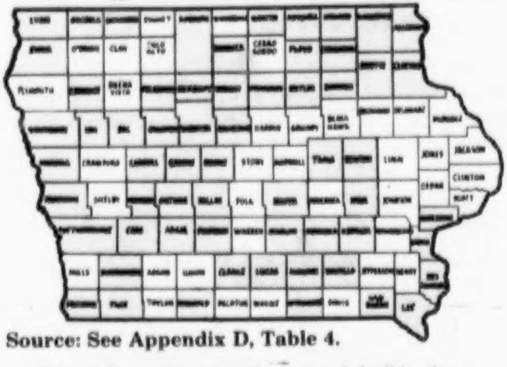
If two regions have the same number of dentists, but one has a younger dental population than the other, then the expectable total number of future man-years of dental practice is greater in the region with the younger dental population, *ceteris paribus.*

Map 5. Comparison of Region to State Mean Age of Dentists for Iowa: 1968



Source: See Appendix D, Table 4.

Map 6. Comparison of County to State Mean Age of Dentists for Iowa: 1963



Source: See Appendix D, Table 4.

***Map with county identifications of legible size on Page 91, Appendices Section.**

Maps 5 and 6 show how the mean age of Iowa's dentists by region and county, respectively, compared with the state's 1968 mean age. The two maps, for example, both illustrate that relatively more younger dentists per region and per county tend to locate in eastern Iowa. The mean age of dentists in these areas was below the state's mean. From Map 6, it can be seen that all of Iowa's metropolitan counties, except for Woodbury and Pottawattamie, had lower mean ages than the state as a whole.

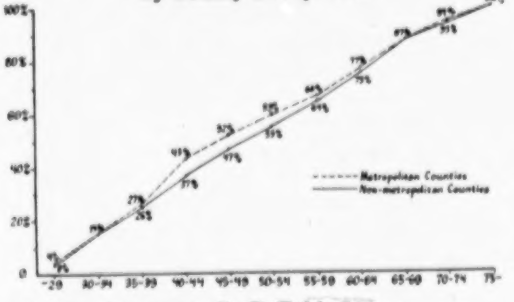
Dentists in rural coummunities were older, on the average, than those in urban areas. Data for dentists in 1965 indicate that the median age for dentists living in metropolitan counties (i.e., those counties with a central city of 50,000 or more inhabitants) was approximately 48. For the non-metropolitan county group, the median was slightly more than 51 years of age.

The cumulative percentage age distribution for Iowa by metropolitan versus non-metropolitan county group is presented on Chart 2. The two distributions differ most between the ages of 40 and 65, where the cumulative percentage for dentists from metropolitan counties lies above that for dentists from non-metropolitan counties.

This implies, of course, that a relatively larger proportion of dentists from the metropolitan counties must have been between 40 and 44 years of age than in the non-metropolitan set of counties.

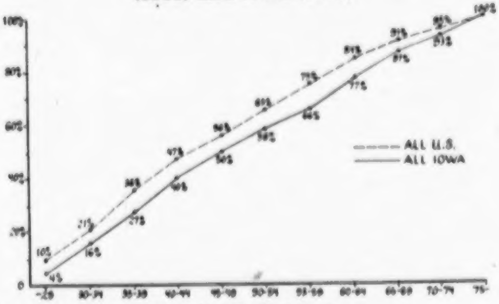
The cumulative percentage distributions of dentists by age for Iowa and the United States are shown on Chart 3. Although the figures for

Chart 2. Cumulative Percentage Age Distribution of Dentists for Iowa by County Group: 1965



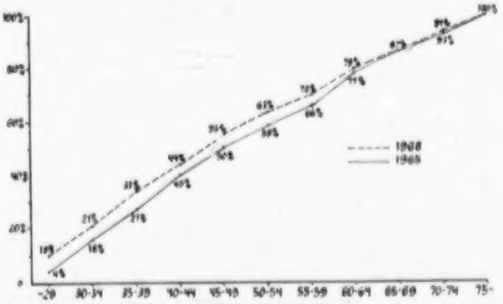
Source: See Appendix D, Table 5.

Chart 3. Cumulative Percentage Age Distribution of Dentists for United States (1963) and Iowa (1965)



Source: See Appendix D, Table 6.

Chart 4. Cumulative Age Distribution of Dentists for Iowa: 1965 and 1968



Source: See Appendix D, Table 7.

the United States are for 1963, and Iowa's for 1965, the available data do provide an "adequate" basis for comparing the two age distributions. It is apparent that Iowa had a greater percentage of older dentists than the nation. Twenty-three percent of Iowa dentists were 60 years of age or over, compared to 16 percent for the United States.

At the other end of the age spectrum, approximately 27 percent of Iowa's dentists were under 40, while 39 percent of the nation's were below 40 years of age. Although the data do not permit the computation of mean ages for purposes of comparison, it is clear from Chart 3 that the *median* age for dentists in Iowa was higher than that for dentists in the United States.

Chart 4 presents the 1965 and 1968 cumulative age distributions for Iowa dentists. This information is most impressive in that it reveals a considerable improvement in the distribution of Iowa dentists by age. In 1965 some one-half of the state's dentists were under 50 years of age, but by 1968 this percentage jumped to 55. This change, of course, resulted in a decline in the *median* age of Iowa's dentists from about 50 years in 1965 to slightly more than 49 in 1968.

Education of Dentists in Iowa

The future supply of dentists and dental services in Iowa obviously depends on the rate at which dentists are trained in the state, and upon the interstate migratory flows of trained dentists. Iowa has one state-supported dental school, the University of Iowa's College of Dentistry located at Iowa City.

Through 1968, the College of Dentistry had an estimated 2,283 living graduates with the DDS degree.[3] The number would be somewhat larger if those who graduated with advanced degrees were also included. Table 3 shows that some 80.39 percent of Iowa's dentists in 1968 had graduated from the University of Iowa College of Dentistry. An estimated 1,205 dentists residing in Iowa obtained degrees from Iowa, whereas only 294 held degrees from schools outside of Iowa.

Thus, by 1968 an estimated 1,078 of the 2,283 living graduates of Iowa's College of Dentistry had left the state. This means Iowa is a net exporter of trained dentists, i.e., considerably more dentists trained in Iowa have left the state than have dentists trained in other states entered Iowa.

The supplies of present and future dental services are partially affected by the type and extent of advanced dental training taken by the dentist population. Data pertaining to the proportion of Iowa's dentists with advanced training, and the type of training received, are available for 1965.

Approximately 16 percent of the dentists in Iowa in 1965 had had some type of advanced training; nearly 80 percent had no advanced training; and the advanced training status of the remaining four percent is unknown. Table 4 shows that of those with some advanced training, only 68.2 percent had engaged in post-graduate academic work.

Table 3. Dentists According to School of Graduation for Iowa: 1965 and 1968

School of Graduation	1965[a] Number	1965[a] Percent	1968[b] Number	1968[b] Percent
University of Iowa	1,071	80.35	1,205	80.39
Creighton University	124	9.30	131	8.74
Other Universities	138	10.35	163	10.87
Total	1,333	100.00	1,499	100.00

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. thesis, University of Iowa, Iowa City, Iowa), p. 36.

[b] A Profile of Iowa Dentists – 1968 (unpublished paper provided by the Dental Health Division of the Iowa State Department of Health), p. 7.

Dentists with residency completed accounted for nearly 17 percent of the dentists with advanced training. Dentists with internship completed accounted for another 39 percent; and dentists with neither residency nor internship completed accounted for the remaining 44 percent.

Table 4. Percentage Distribution of Iowa Dentists by Advanced Training Status: 1965[a]

Type of Advanced Training	Number	Percent
Total	1,340	100.00
With Advanced Training	214	15.97
Residency Completed	36	--
Ph.D.; M.D.	1	--
M.A., M.S.	13	--
Post Grad. (year or more)	10	--
No Academic Work	12	--
Internship Completed	83	--
Ph.D.; M.D.	1	--
M.A., M.S.	8	--
Post Grad. (year or more)	18	--
No Academic Work	56	--
Neither Residency nor Internship Completed	95	--
Ph.D., M.D.	4	--
M.A., M.S.	56	--
Post-Grad. (year or more)	35	--
Without Advanced Training	1,070	79.85
Advanced Training Not Reported	56	4.18

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists" (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa) pp. 37-38.

Table 5. Work Activity of Dentists for Iowa: 1965 and 1968

Activity	1968[b] Number	1968[b] Percent	1965[a] Number	1965[a] Percent
Total	1,499	100.00	1,340	100.00
Private Practice	1,252	83.50	1,227	91.50
Full-Time	1,153	- -	- -	- -
Part-Time	99	- -	- -	- -
Other	247	16.50	113	8.50

[a] Jerald L. Brown, "A Distribution of Iowa Dentists" (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 23.

[b] *A Profile of Iowa Dentists – 1968* (unpublished paper provided by the Dental Health Division of the Iowa State Department of Health), p. 5.

Employment Activities of Dentists in Iowa

The number of dentists located in a particular area is a rather poor representation of supply of dental services available to a community. The remainder of this section will detail some of the additional factors which determine supply.

Specifically, the following will be described: (1) the proportion of Iowa's dentists actually engaged in patient care; (2) the type of private practice (i.e., general versus specialized); (3) the time (hours and weeks) actually spent in patient care and (4) the utilization of auxiliary personnel.

Patient Care Activities

Table 5 shows that in 1965 slightly more than 91 percent of Iowa's licensed, resident dentists were employed in direct patient care. By 1968, this percentage slipped to 83.5 as a relatively larger number of dentists evidently were employed by the government, institutions of one kind or another, or were retired.

The decline in the proportion of Iowa dentists engaged in patient care activities between 1965 and 1968 may be partially explained by the fact that the age distribution of Iowa dentists shifted over this period, having a lower mean in 1968 (Table 7, Appendix D). In this regard, cross-sectional data reveal that younger dentists (under 30 years of age) are likelier to be working in activities "other" than patient care than are dentists in other age categories. An explanation of the large proportion of dentists under 30 years of age engaged in non-patient-care work activities compared to other age groups is provided by the fact that it takes time to accumulate the financial resources required to start up and maintain a dental practice.

Table 6 presents the data referred to in the previous paragraph. The reader should note that the information shown on Table 6 is based on 95.8 percent of Iowa dentists in 1965. It should not be surprising, therefore, to discover by these data that only 89.1 percent of Iowa dentists (i.e., the percent of self-employed dentists plus those employed by other dentists) were engaged in direct patient care activities, rather than 91.5 percent as presented on Table 5.

Type of Private Practice

Since general practitioners and specialists do not, by definition, provide a common range of services, it is essential to this kind of study to account for the distribution of Iowa's practicing dentists by type of practice.

In 1965, approximately 88 percent of Iowa's patient care dentists were general practitioners, and the remaining 12 percent limited their practice to particular specialties as shown on Table 7. Three years later, it was estimated that nearly 90 percent of the state's patient care dentists in 1968 were general practitioners and only about 10 percent were limiting their practice to a specific specialty.

This time interval is too short to identify a definite trend, especially with the realistic chance of sampling and reporting errors existing in the data.

The data on Table 7 show that the large majority of Iowa dentists in limited practices during 1965 and 1968 were in orthodontics, oral surgery, and pedodontics.

Weeks and Hours spent in Practice

It is acknowledged that the most essential human input in the production of dental services is time spent by the dentist. Clearly, as the amount of time dentists allocate to patient care activities increases, so does the potential supply of dental services. Table 8 presents estimates of the average number of weeks and hours worked by dentists in 1964.

Dentists engaged in patient care activities worked an average of 41.3 hours per week and 47.3 weeks per year in 1964. This represented considerably more time spent in market work than dentists engaged in any of the other categories of activities shown on Table 8.

The reader, however, is directed to Footnote b, Table 8. This table makes it clear that age is a significant variable in determining the supply of dental services. Observe, for example, that dentists in private practice who were 55 years of age or over worked fewer hours per week than dentists in younger age categories.

It will be noted that the average dentist in the 50 to 54 year old age group worked an average of 2,076 hours per year—more than for dentists in any other age group. The dentist 65 years of age and older worked an average of 1,718 hours per year in 1964—the least for patient care dentists of all ages.

Table 6. Principal Current Employment of Dentists for Iowa by Age: 1965[a]
(percent in parentheses)

Current Employment	Number of Dentists	-29	30-34	35-39	40-44	45-49
Self-Employed	1,125 (87.6)	38 (82.6)	138 (91.3)	132 (90.4)	158 (92.9)	122 (96.8)
Employed by other Dentist	19 (1.5)	1 (2.2)	4 (2.6)	3 (2.0)	3 (1.7)	0 (0.0)
Retired	73 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Other[b]	67 (5.3)	7 (15.2)	9 (6.1)	12 (7.6)	9 (5.4)	4 (3.2)
All Employed	1,284[c] (100.0)	46 (3.58)	151 (11.76)	146 (11.37)	170 (13.24)	126 (9.81)

Current Employment	50-54	55-59	60-64	65 69	70-74	75
Self-Employed	90 (90.0)	103 (97.2)	124 (87.9)	104 (78.8)	60 (74.1)	56 (65.9)
Employed by other Dentist	0 (0.0)	0 (0.0)	3 (2.1)	3 (2.1)	2 (2.5)	0 (0.0)
Retired	3 (3.0)	0 (0.0)	8 (5.7)	20 (15.2)	18 (22.2)	24 (28.2)
Other[b]	7 (7.0)	3 (2.8)	6 (4.3)	5 (3.8)	1 (1.2)	5 (5.9)
All Employed	100 (7.79)	106 (8.26)	141 (10.98)	132 (10.28)	81 (6.31)	85 (6.62)

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[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists" (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 78.

[b] Includes government, military, graduate school and staff, nondental and other dental.

[c] Represents 95.8 per cent of 1,340 Iowa dentists.

Table 7. Distribution of Practicing Dentists for Iowa by Type of Private Practice: 1965 and 1968

	1965[b]	1968[d]
Total Private Practice	1,150[c]	1,252
General Practice	1,007	1,125
Limited Practice[a]	143	127
Oral Pathology	4	0
Oral Surgery	33	32
Orthodontics	52	58
Pedodontics	29	28
Prosthodontics	14	3
Periodontics	11	6

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[a] No dentists reported limiting their practice to either endodontics or public health dentistry.

[b] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 83.

[c] Represents 85.8 per cent of the 1,340 in-state dentists.

[d] Adapted from an unpublished paper entitled *A Profile of Iowa Dentists – 1968*, provided by the Dental Health Division of the Iowa State Department of Health, Des Moines, Iowa.

The average for all dentists engaged in patient care was 1,954 hours per year. This figure is 2.7 times greater than that for dentists in research; 1.8 times greater than that for dentists in teaching; and twice that for dentists engaged in "other" dental activities.

It will be recalled from earlier discussion that there were more active dentists per capita in Iowa's metropolitan county grouping than in the state's non-metropolitan county groups. However, Jerald Brown reported that in 1964 dentists practicing in metropolitan counties worked slightly fewer weeks per year, as a group, than did dentists from non-metropolitan counties with the exception of dentists from counties with central cities of 25,000-49,999 persons.

As a rule, metropolitan county dentists also worked fewer hours per week—except for those who worked 48 or 49 weeks per year. The latter group seemed also to work consistently longer hours per week.[4]

Utilization of Dental Auxiliaries

Continuing with the identification of factors affecting the supply of dental services in Iowa, attention is now directed to a variable of major

Table 8. Average Weeks Worked per Year and Hours Worked per Week by Dentists for Iowa: 1964[a]

Age	Number of Dentists	Patient Care[b]			Research			Teaching			Other		
		Number	Weeks	Hours	Number	Weeks	Hours	Number	Weeks	Hours	Number	Weeks	Hours
All Ages	1,147	1,109	47.3	41.3	20	31.3	22.9	44	38.4	28.1	34	37.3	26.1
-29	31	29	42.6	42.4	..	..	..	1	48.0	..	4	49.7	35.3
30-34	133	129	47.5	42.8	2	43.5	55.0	7	37.0	21.0	3	21.0	34.0
35-39	140	135	48.0	42.1	7	31.6	23.9	8	43.5	33.2	3	49.0	42.5
40-44	161	156	47.9	43.0	4	21.7	21.7	11	33.7	23.9	8	39.7	8.5
45-59	119	115	47.9	42.5	2	8.0	10.0	3	45.0	45.0	4	35.2	25.0
50-54	89	87	48.5	42.8	2	40.0	6.0	2	50.0	30.0	1	52.0	14.0
55-59	99	97	47.8	40.6	..	..	..	1	50.0	40.0	3	49.0	22.0
60-64	122	119	46.3	40.6	1	40.0	2.0	2	38.0	26.0	4	34.0	36.3
65-	209	198	46.7	36.8	2	..	..	9	32.0	30.3	4	25.0	42.7
Not Reported	44	44	46.6	41.2	..	..	..	..	..	..	..	..	..

[a] Jerald L. Brown, "A Distribution of Iowa Dentists" (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 40.

[b] Many dentists engaged in research and training are secondarily employed in private practice on a part-time basis; hence the low average number of weeks and hours worked.

concern, namely: the extent to which auxiliary personnel are utilized by Iowa dentists. Within the framework of the dentist's average work time, the extent to which he uses auxiliary personnel clearly influences the potential of dental services that can be produced.

Table 9 shows the percent of self-employed Iowa dentists who hired auxiliaries in 1965. It is estimated that approximately 85 percent of the state's practicing dentists hired some type of auxiliary in 1965.

Sixty-nine percent of Iowa's practicing dentists hired dental assistants on a full-time basis and 9.2 percent on a part-time basis, according to Table 9. As for the other types of auxiliary personnel, the percentages by which they were hired on a full-time and part-time basis were remarkably even. Much lower percentages of the state's practicing dentists were hired dental hygienists and dental technicians, either because (1) their services were too costly compared to those of dental assistants or (2) the services of dental hygienists and dental technicians were simply not available.[5]

Table 9. Percentage of Self-Employed Dentists Using Auxiliaries for Iowa: 1965[a]

Type of Position	Percent
Hygienist	
Full-Time	5.0
Part-Time	5.9
Technician	
Full-Time	2.0
Part-Time	2.0
Assistant	
Full-Time	69.0
Part-Time	9.2
Secretary and Receptionist	
Full-Time	15.8
Part-Time	11.0

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists", (unpublished M.A. thesis, University of Iowa, Iowa City, Iowa, 1969), p. 51.

In any event, Jerald L. Brown found that dentists of middle age—between 35 and 50 years old—were more inclined to hire auxiliaries, particularly hygienists and technicians, than dentists in other age groups.[6] He deduces that dentists in the middle age bracket had developed sizeable clienteles and were in a better financial position to realize the "economies" associated with hiring the more specialized type of auxiliary manpower.

Table 10 presents the number and percent of Iowa dentists, by community size, who were employing auxiliary personnel in 1965. The reader should note, however, that the data in this table, unlike Table 9, pertain to *all* dentists and not just to those dentists who were in private practice.

According to the data on Table 10, some 79 percent of the dentists in the "all metropolitan" counties of Iowa employed auxiliary personnel, compared to only 72 percent in the "all non-metropolitan" counties.

In view of previous findings, this fact is particularly interesting. First, since "economies" in the employment of auxiliary manpower are more probable at high levels of production, the demand for dental services in the metropolitan counties was probably somewhat higher and more stable than in the non-metropolitan. This

Table 10. Utilization of Dental Auxiliaries for Iowa by County Groups: 1965[a]

County Group	Number of Dentists	Number Using Auxiliaries	Percent
All Metropolitan Counties	490	385	79
Dubuque	49	39	80
Polk	153	128	84
Linn	77	62	81
Woodbury	55	42	76
Blackhawk	61	49	80
Scott	61	41	67
Pottawattamie	34	24	71
All Non-Metropolitan Counties	755	542	72
Central City			
10,000 - 49,999	283	208	73
5,000 - 9,999	220	166	75
2,500 - 4,999	170	114	67
Under 2,500	82	54	66
Total Iowa	1,245[b]	927	74

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists" (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 52.

[b] Represents 92.9 percent of 1,340 Iowa dentist.

probability should be regarded good reason for modifying any assumption that because the ratio of population per active dentist was lower in metropolitan than in non-metropolitan counties, the more populous counties were relatively "better off."

Second, the fact that dentists in the metropolitan counties spent slightly less time in market work than those in non-metropolitan counties, combined with the preceding point, implies that auxiliary manpower adds significantly to the productivity of dental services.

The basic data used in Table 10 are reorganized for use in Tables 11 and 12. Table 11 shows that in 1965 there were 1,842 dental auxiliary positions in Iowa—1,127 full-time and 715 part-time. These auxiliaries were employed by 74 percent of *all* dentists in the state.

From the standpoint of geographic distribution, the percentage of dentists employing auxiliaries varied considerably from region to region. The largest percent was 84 in Region X, and the smallest was 62 percent in Region I. The actual numbers of dentists with auxiliaries by type and by region are presented in Table 12.

Table 11. Full-time and Part-time Dental Auxiliary Positions for Iowa by Region and Metropolitan County: 1965[a]

	Region and Metropolitan County	Number of Dentists	Dentists With Auxiliaries	Percent With Auxiliaries	Number of Auxiliary Positions		
					Full Time	Part Time	Total
	Total	1,245	927	74(%)	1,127	715	1,842
I.	Decorah	29	18	62	21	7	28
II.	Mason City	67	62	82	72	46	118
III.	Spencer	52	37	71	46	24	70
IV.	Sioux City	104	75	72	89	37	126
	Woodbury	55	42	76	54	22	76
V.	Fort Dodge	56	47	84	53	24	77
VI.	Marshalltown	40	30	75	35	27	62
VII.	Waterloo	99	75	66	100	73	173
	Black Hawk	61	49	80	68	62	130
VIII.	Dubuque	56	45	80	45	25	70
	Dubuque	49	39	80	38	19	57
IX.	Davenport	101	76	75	105	68	173
	Scott	61	41	67	50	48	98
X.	Cedar Rapids	174	112	64	139	97	236
	Linn	77	62	81	87	43	130
XI.	Des Moines	226	173	77	216	209	425
	Polk	153	128	84	154	152	306
XII.	Carroll	31	22	71	25	13	38
XIII.	Council Blubbs	74	55	74	60	23	83
	Pottawattamie	34	24	71	24	15	39
XIV.	Creston	18	15	83	18	4	22
XV.	Ottumwa	54	42	78	48	15	63
XVI.	Burlington	55	43	78	55	23	78
	All Metropolitan Counties	490	385	79	475	361	836
	All Non-Metropolitan Counties	755	542	72	652	354	1,006

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. Thesis, University of Iowa, Iowa City, Iowa, 1969), p. 58.

Table 12. Utilization of Auxiliaries by Type of Employment for Iowa by Region and Metropolitan County: 1965[a]

Region and Metropolitan County	Type of Position[c]											
	Hygienist			Assistant			Technician			Sec./Rec.		
	TOTAL	Full Time	Part Time Only	TOTAL	Full Time	Part Time Only	TOTAL	Full Time	Part Time Only	TOTAL	Full Time	Part Time Only
Total[b]	119	55	64	854	753	101	44	22	22	293	173	120
I. Decorah	2	1	1	18	17	1	0	0	0	3	2	1
II. Mason City	7	4	3	59	49	10	2	2	0	14	9	5
III. Spencer	3	2	1	37	35	2	1	1	0	14	6	8
IV. Sioux City	3	2	1	70	64	6	1	1	0	22	13	9
Woodbury	2	1	1	39	36	3	1	1	0	17	10	7
V. Fort Dodge	3	2	1	46	40	6	0	0	0	9	8	1
VI. Marshalltown	6	2	4	27	26	1	4	0	4	11	7	4
VII. Waterloo	8	2	6	72	64	8	1	0	1	31	18	13
Black Hawk	6	2	4	47	40	7	1	0	1	24	14	10
VIII. Dubuque	2	2	0	42	36	6	0	0	0	9	2	7
Dubuque	2	2	0	36	31	5	0	0	0	7	0	7
IX. Davenport	17	8	9	66	62	4	4	3	1	29	19	10
Scott	9	4	5	34	31	3	2	1	1	16	9	7
X. Cedar Rapids	29	12	17	101	82	19	7	3	4	34	25	9
Linn	17	8	9	56	48	8	5	2	3	21	18	3
XI. Des Moines	28	11	17	156	133	23	16	6	10	71	30	41
Polk	20	8	12	114	97	17	12	4	8	51	20	31
XII. Carroll	0	0	0	21	17	4	1	1	0	5	4	1
XIII. Council Bluffs	2	1	1	43	39	4	3	3	2	1	9	3
Pottawattamie	0	0	0	23	19	4	1	1	0	3	3	0
XIV. Creston	2	1	1	12	11	1	1	0	1	7	6	1
XV. Ottumwa	1	1	0	39	37	2	2	2	0	9	6	3
XVI. Burlington	6	4	2	38	34	4	1	1	0	13	8	5

[a] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. Thesis, University of Iowa, City, Iowa, 1969), p. 57.

[b] Totals indicate the number of dentists employing one or more auxiliaries full-time or part-time.

[c] "Other" type of auxiliary position has been omitted (15 full time and 30 part time).

SUMMARY

This section presented some characteristics of Iowa dentists as they relate to the supply and geographic distribution of dentists and dental services in Iowa. In 1968, some 1,252 dentists out of Iowa's 1,499 dentists were engaged in full-time or part-time patient care activities. Only 119 Iowa dentists were retired.

The 1968 ratio of population to active dentists was 1,994. This was considerably lower than in earlier years of the 1960's. It was noted, however, that the geographic distribution of Iowa dentists relative to population was not uniform. Mainly, there were fewer persons per active dentist in the metropolitan areas than in the non-metropolitan areas; though a comparison of data for 1965 and 1968 showed this difference had narrowed somewhat.

It was pointed out that differences in ratios of population to active dentist in various geographic areas are an inadequate basis for comparing between areas the availability of dental services relative to demand. For example, it was discovered that not only were there fewer persons per active dentist in Iowa metropolitan areas than in non-metropolitan areas, but that dentists in the metropolitan areas tended on the average to be younger than those in non-metropolitan areas.

It was also shown, however, that (1) among working dentists, a much greater proportion of younger dentists engage in non-patient care activities than dentists in older age brackets; and (2) among practicing dentists, those in metropolitan areas tend on the average to work fewer weeks per year and in some cases fewer hours per week than practicing dentists in the non-metropolitan counties.

The negative effects on supply implied by the above two points must be qualified, for the study disclosed that dentists in Iowa's metropolitan counties are likelier to hire auxiliary manpower than the non-metropolitan dentists. This fact can be given two interpretations: (1) the greater the use of auxiliary manpower, the greater the potential supply of dental care; and (2) demand must be relatively higher and more stable in those areas where auxiliaries are in greater use, because "economies" associated with the employment of auxiliary health manpower mostly occur in relatively large scale practices.

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[1] "Active" dentists are defined as all non-retired, licensed resident dentists.

[2] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. Thesis, The University of Iowa, Iowa City, Iowa, 1969), p. 143.

[3] Estimate provided by the Alumni Records Division of The University of Iowa, Iowa City, Iowa.

[4] Jerald L. Brown, "A Distribution Model of Iowa Dentists," (unpublished M.A. Thesis, The University of Iowa, Iowa City, Iowa, 1969), p. 44.

[5] Brown reports that in 1965 ". . . almost 16 per cent of Iowa's dentists reported one or more auxiliary vacancies. Of the 927 dentists who utilized auxiliary personnel, 167 dentists or 18 per cent indicated one or more positions unfilled, compared to 10 per cent or 32 of the 318 dentists who did not employ auxiliaries . . .," *Ibid.*, p. 69.

[6] *Ibid.*, p. 48.

PODIATRY

Podiatry, formerly known as chiropody, is the health profession that deals with the examination, diagnosis, prevention, treatment, and care of conditions and functions of the human foot.[1] Based on available data, it appears that over the decade of the 'sixties the absolute number of podiatrists in Iowa and in the United States has been quite stable.

Nationally, the number of podiatrists increased modestly from about 6,400 in 1950 and 7,600 in 1964 to about 8,000 in 1967 and 8,500 in 1968. The number of Iowa-licensed podiatrists living in the state increased from 96 in 1964 to 103 in 1968 and 101 in 1969. (See Table 1, Appendix E.)

Chart 1 shows that Iowa's population per licensed podiatrist ratio was substantially higher than the corresponding United States ratio spanning the years 1964 to 1969. However, this ratio has fluctuated within a very narrow range for both Iowa and the United States over this period. In 1968 there were 23,496 persons per podiatrist in the United States, and in 1969 there were 27,247 persons per podiatrist in Iowa.

Table 1. Percentage Distribution of Podiatrists with Iowa Licenses by State of Residence: 1960-70[a]

Residence	Number	Percent
Iowa	101	55.50
Non-Iowa	81	44.50
Total	182	100.00

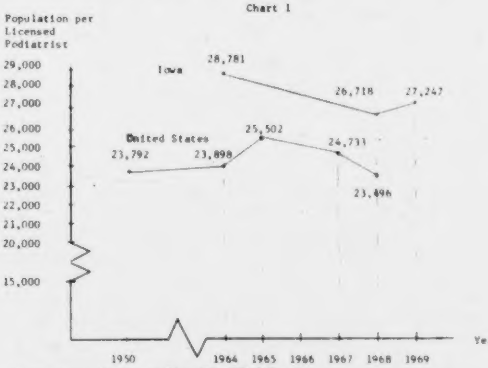
[a] Data provided by the Iowa Podiatry Society, Des Moines, Iowa.

CHARACTERISTICS OF IOWA'S PODIATRISTS

The distribution of Iowa-licensed podiatrists by state of residence is shown in Table 1. Iowa issued 182 licenses to practice podiatry during the 1969-70 year. However, of the podiatrists licensed by the state, only 101—or 55 percent—reported that they lived in Iowa. The rest lived in other states.

According to an unpublished report by the Iowa Podiatry Society, one Iowa resident podiatrist practices in Nebraska and two Illinois resident podiatrists have practices in Iowa. Among the 101 resident podiatrists licensed to practice in Iowa during 1969-70, 60 are members of the Iowa Podiatry Society.

Chart 1. Population per Licensed Podiatrist for Iowa and the United States: 1950-1969



Source: Appendix E, Table 1.

Geographic Status

Considerable variation in the ratios of population per licensed podiatrist existed among multi-county regions in Iowa during 1969. Map 1 shows that seven of the 16 regions had ratios which exceeded the 1969 ratio of 27,247 for the state as a whole. Eight regions had ratios of ranging from 20,000 to 30,000 persons per licensed podiatrist; and only one, Region VIII, had a ratio below 20,000 persons. The specific 1969 ratio associated with each region in Map 1 is presented in Table 1, Appendix E.

Map 2 gives more detail as to geographic distribution of Iowa's podiatrists. It shows that 60 of Iowa's counties were without the services of a podiatrist in 1969. Of Iowa's 99 counties, only 12 had ratios of population per licensed podiatrist below 15,000. Nineteen counties had 15,000 to 25,000 persons per podiatrist, and eight had more than 25,000 persons per podiatrist.

Educational Status

The first Podiatry Licensing Bill passed in Iowa took effect in 1921. At that time, podiatrists were required to have a high school education plus two years of training in a recognized Podiatry College. The present law requires that an individual may sit for his licensure examination only after he has a high school diploma plus two years of premedical education, followed by four years of training at a recognized College of Podiatric Medicine.

There are five Podiatry Colleges in the United States, one in each of the following

Table 2. Percentage Distribution of Podiatrists by Type of Employment: Iowa and United States

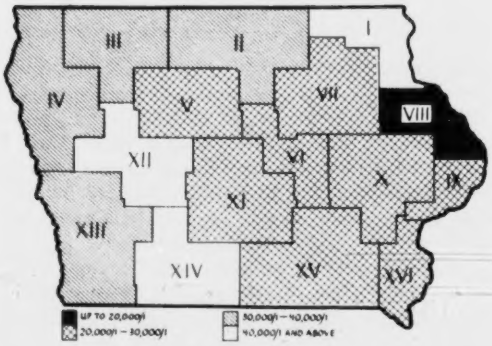
Type of Employment	Iowa: 1969-70[a] Number	Iowa: 1969-70[a] Percent	United States: 1964[b] Number	United States: 1964[b] Percent
Private Practice	88	88.00	3,093	94.02
Institutional (e.g., Veterans Administration)	1	1.00	49	1.48
Administration, Teaching, Research	0	0.00	12	.36
Other (e.g., internship)	1	1.00	63	1.92
Retired	10	10.00	73	2.22
Total	100	100.00	3,290[c]	100.00
Iowa Resident, practicing in Nebraska	1			
Illinois Resident, practicing in Iowa	2			

[a] Data provided by the Iowa Podiatry Society, Des Moines, Iowa.

[b] U.S. Department of Health, Education and Welfare, Reported from the National Center for Health Statistics, *Health Resources Statistics;* Washington, D.C.; U.S. Government and Printing Office, 1968) p. 164.

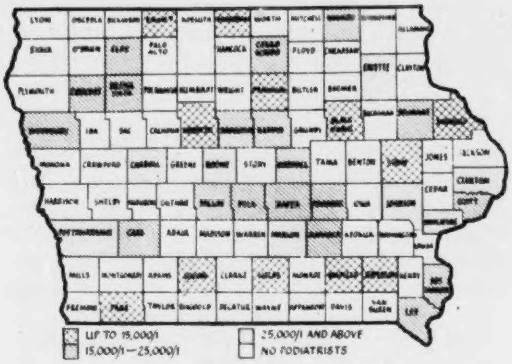
[c] Represents 41 percent response to a questionnaire mailed to all known registered podiatrists (8,008).

Map 1. Population per Licensed Podiatrist for Iowa by Region: 1969



Source: See Appendix E, Table 2.

Map 2. Population per Licensed Podiatrist in Iowa by County: 1969



Source: See Appendix E, Table 2.

***Map with county identifications of legible size on Page 91, Appendices Section.**

states: California, Ohio, New York, Pennsylvania and Illinois. The 60 members of the Iowa Podiatry Society are all graduates of the Illinois College of Podiatric Medicine.

Employment Status

Table 2 depicts by type of employment in 1969 the distribution of podiatrists with Iowa licenses and residing in Iowa. A similar, national distribution is presented for the year 1964. Based on a 41 percent response to a nationally circulated questionnaire, Table 2 shows that nearly 98 percent of the nation's podiatrists were actively employed in 1964. About 94 percent were in private practice.

In Iowa, 88 percent of the resident licensed podiatrists were active in private practice in 1969. Exactly 10 percent of Iowa's licensed podiatrists were retired in 1969, compared to an estimated 2.22 percent retired in the United States in 1964.

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[1] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D. C.

CHIROPRACTIC

"Chiropractic is that science and art which utilizes the inherent recuperative powers of the body and deals with the relationship between the nervous system and the spinal column, including the immediate articulations, and the role of this relationship in the restoration and maintenance of health.

"The practice of chiropractic deals with the analysis of any interference with normal nerve transmission and expression, the procedure preparatory to and complementary to the correction thereof by an adjustment of the articulations of the vertebral column, its immediate articulations or by other incidental adjustment for the restoration and maintenance of health; it includes the normal regimen and rehabilitation of the patient without the use of drugs and surgery. The term analysis is construed to include physical examination, the use of x-ray and other analytical instruments generally used in the practice of chiropractic."[1]

Geographic Distribution

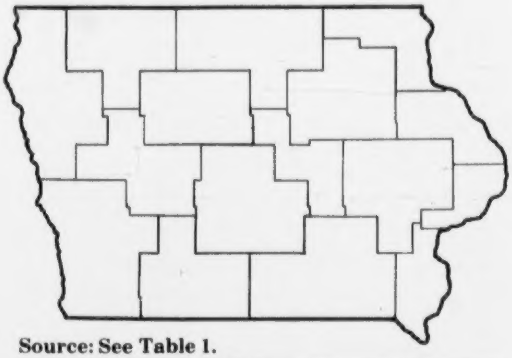
Table 1 presents the ratios of population per licensed Iowa-resident chiropractor, based exclusively on the 1969 membership of Iowa Chiropractic Society. The accuracy of these ratios is limited to the extent that the Society's membership comprises only about 40 percent of the state's chiropractors.[2]

Table 1. Population per Resident Iowa Chiropractic Society Member: Iowa, 1969

Region	Number[b]	Iowa's 1967 Population[a]	Population per Licensed Resident Chiropractor
Region I	5	69,540	13,908
Allamakee	2	15,960	7,980
Clayton	2	21,490	10,745
Howard	1	12,440	12,440
Winneshiek	0	19,650	0
Region II	19	156,960	8,261
Cerro Gordo	7	48,570	6,939
Floyd	2	20,860	10,430
Franklin	2	13,730	6,865
Hancock	1	13,910	13,910
Kossuth	1	24,550	24,550
Mitchell	2	13,680	6,840
Winnebago	3	12,690	4,230
Worth	1	8,970	8,970

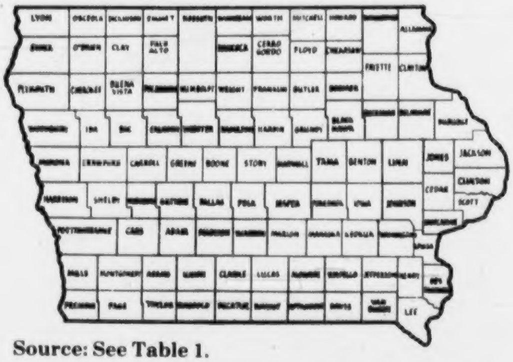
Continued next page

Map 1. Population per Iowa Chiropractic Society Member for Iowa by Region: 1968



Source: See Table 1.

Map 2. Population per Iowa Chiropractic Society Member by County: 1969



Source: See Table 1.

*Map with county identifications of legible size on Page 91, Appendices Section.

Using the data in Table 1, it was calculated that 78 percent of Iowa's 99 counties and 15 of 16 regions had resident Society members. Member chiropractors are most heavily concentrated in Iowa's eastern and northern counties. Iowa's southwest counties had very few Society members and Region XIV had none.

Maps 1 and 2 present the ratios of population per Iowa Chiropractic Society Member for each of Iowa's regions and counties, respectively, in relation to the state's ratio of 11,097 persons per society member. The non-shaded regions and counties in the two maps had ratios which were lower than the state's in 1969. Map 1 shows that Iowa's eastern and east-central regions had fewer persons per Iowa Chiropractic Society member than did the state as a whole.

Region	Number[b]	Iowa's 1967 Population[a]	Population per Licensed Resident Chiropractor
Region III	16	107,970	6,748
Buena Vista	3	20,640	6,880
Clay	3	17,990	5,997
Dickinson	3	12,820	4,273
Emmet	2	14,280	7,140
O'Brien	2	18,990	9,495
Osceola	1	8,970	8,970
Palo Alto	2	14,280	7,140
Region IV	13	210,450	16,188
Cherokee	2	17,690	8,845
Ida	1	9,410	9,410
Lyon	1	14,020	14,020
Monona	0	13,040	0
Plymouth	2	24,220	12,110
Sioux	1	26,420	26,420
Woodbury	6	105,650	17,608
Region V	9	128,960	14,329
Calhoun	1	15,880	15,880
Hamilton	1	19,950	19,950
Humboldt	2	12,990	6,495
Pocahontas	1	13,480	13,480
Webster	2	47,860	23,930
Wright	2	18,800	9,400
Region VI	12	97,840	8,153
Hardin	3	21,660	7,220
Marshall	6	37,650	6,275
Poweshiek	2	18,140	9,070
Tama	1	20,390	20,390
Region VII	25	240,640	9,626
Black Hawk	10	125,360	12,536
Bremer	1	20,940	20,940
Buchanan	0	20,450	0
Butler	3	16,290	5,430
Chickasaw	4	14,450	3,613
Fayette	5	29,120	5,824
Grundy	2	14,030	7,015
Region VIII	11	126,040	11,095
Delaware	0	17,030	0
Dubuque	9	88,120	9,791
Jackson	2	20,890	10,445
Region IX	25	216,960	8,678
Clinton	3	56,270	18,757
Muscatine	2	34,680	17,340
Scott	20	126,010	6,301
Region X	36	301,230	8,368
Benton	6	22,510	3,752
Cedar	4	18,050	4,513
Iowa	5	16,590	3,318
Johnson	3	59,310	19,770
Jones	1	20,060	20,060
Linn	13	145,720	11,209
Washington	4	18,990	4,748
Region XI	35	470,950	13,413
Boone	4	25,620	6,405
Dallas	0	23,360	0
Jasper	2	34,730	17,365
Madison	0	11,970	0
Marion	4	26,170	6,543
Polk	17	272,810	16,048
Story	6	54,580	9,097
Warren	2	26,170	13,085
Region XII	10	96,380	9,638
Audubon	0	10,020	0
Carroll	3	24,300	8,100
Crawford	3	19,540	6,513
Greene	2	13,290	6,645
Guthrie	1	12,990	12,990
Sac	1	16,240	16,240
Region XIII	11	188,590	17,145
Cass	0	18,080	0
Fremont	0	9,880	0
Harrison	0	16,840	0
Mills	1	11,370	11,370
Montgomery	2	13,070	6,535
Page	1	19,040	19,040
Pottawattamie	5	84,510	16,902
Shelby	2	15,800	7,900
Region XIV	0	60,600	0
Adair	0	9,330	0
Adams	0	6,360	0
Clarke	0	7,620	0
Decatur	0	7,380	0
Ringgold	0	7,150	0
Taylor	0	9,470	0
Union	0	13,290	0
Region XV	10	158,040	15,804
Appanoose	1	15,270	15,270
Davis	0	8,780	0
Jefferson	3	14,890	4,963
Keokuk	2	15,250	7,625
Lucas	1	10,130	10,130
Mahaska	3	21,600	7,200
Monroe	0	9,410	0
Van Buren	0	9,380	0
Wapello	1	44,610	44,610
Wayne	0	8,720	0
Region XVI	11	120,850	10,986
Des Moines	3	47,720	15,907
Henry	2	17,590	8,795
Lee	5	44,860	8,972
Louisa	1	10,680	10,680
State Total	248	2,752,000	11,097

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[a] 1967 Population figures from Records and Statistics Division, State Department of Health.

[b] Chiropractor count from Iowa Chiropractic Society and includes only those who are members. They comprise about 40% (250/600) of the state total.

Table 2 presents the population per licensed resident chiropractor ratios for the United States and Iowa. These data indicate that in 1965 the total number of licensed chiropractors in relation to the population was much higher in Iowa than in the nation. It was estimated that in Iowa there were only 4,707 persons per licensed chiropractor compared with 10,131 persons per licensed chiropractor in the United States.

Table 2. Population per Licensed Resident Chiropractor: United States and Iowa, 1950, 1960, and 1965

	Licensed Resident Chiropractors[a]			Population[b]			Population per Licensed Resident Chiropractors		
	1950	1960	1965	1950	1960	1965	1950	1960	1965
Iowa	---	---	558	---	---	2,768,000	---	---	4,707
United States	13,091	14,360	19,131	151,326,000	179,323,000	193,815,000	11,560	12,432	10,131

[a] *Health Resources Statistics – 1968*, National Center for Health Statistics, U.S. Public Health Service.
[b] U.S. Bureau of Census, Statistical Abstract of the United States – 1969, (90th Edition), Washington, D.C., 1969.

The United States Public Health Service reports that Iowa has the third highest ratio of resident licensed chiropractors per 100,000 population. New Hampshire and Missouri lead with 31.3 and 29.8, respectively, while Iowa's ratio is 28.7.[3]

Education and Licensure

Chiropractic has been licensed in Iowa since 1921. Iowa is one of 48 states and the District of Columbia that were requiring licensure as of 1966.[4] All licensing states require a minimum of a high school diploma and a four-year program in a college of chiropractic accredited by either the American Chiropractic Association (national headquarters: Des Moines, Iowa) or the International Chiropractic Association (national headquarters: Davenport, Iowa).

Some states also require one to two years of undergraduate work preparatory to beginning chiropractic studies.[5] During 1965, there were 1,285 licenses issued by the State of Iowa.[6] Of these, only 588 are held by Iowa residents.[7] The reason for this is that the largest college of chiropractic in the nation is located in Iowa and many graduates take the licensing examination in Iowa under reciprocity with other states.

Table 3 shows that the number of graduates from chiropractic colleges across the nation has remained fairly steady since 1961.

In 1964-65, there were 2,940 students in the 12 chiropractic colleges in the United States. Palmer College of Chiropractic in Davenport, Iowa, had 1,075 (37 percent) of the total number of students during this period. Of the 611 graduates in 1964-65, 261 (42 percent) received their diploma from Palmer.[8]

Practice

The greatest number of licensed chiropractors in the United States are in independent private practice. Others are employed by individual firms, chiropractic schools and clinics, or as assistants to practicing Doctors of Chiropractic.[9]

Table 3. Graduates of Approved Chiropractic Colleges: United States, 1961-67[a]

Year	Graduates
1961	665
1962	646
1963	597
1964	564
1965	627
1966	651
1967	687

[a] Approved by American Chiropractic Association or International Chiropractic Association. National Center for Health Statistics, *Health Resources Statistics, 1968;* Public Health Service, Washington, D.C.

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[1] Statement provided by the Iowa Chiropractic Society, Des Moines, Iowa.

[2] Based on Iowa Chiropractic Society (1969) Membership List of 248 and 1965 estimate of 588 chiropractors licensed and resident.

[3] National Center for Health Statistics, *Health Resources Statistics, 1965,* Public Health Service, Washington, D.C.

[4] *State Licensing of Health Occupations, 1968,* U.S. Public Health Service, Washington, D.C., 1965.

[5] *Ibid.*

[6] *Ibid.*

[7] Table 1.

[8] *Health Resources Statistics, 1965, op. cit.*

[9] *Ibid.*

OPTOMETRY

Optometrists are health personnel who specialize in vision analysis. A Doctor of Optometry examines the eyes, prescribes lenses and other visual aids, and provides visual training and orthoptics or other treatment; however, he does not treat eye diseases or perform surgery.

Optometry is licensed in all states. Iowa law requires that licensed optometrists be graduates of optometry schools and pass a licensing examination. Schools approved by the state examining board must offer a four-year curriculum including a 150-hour course of study in the physiology of the eye, optical physics, anatomy of the eye, opthalmology, and practical optometry.[1] In addition, postgraduate study is requisite for license renewal. According to the Iowa Optometric Association, proof of 12 hours of educational program attendance is annually required for license renewal.

Population per licensed optometrist ratios for the United States and Iowa are reported in Table 1 for the years 1966 to 1968. If this statistic provides a reliable index of the availability of optometrists' services, then Iowa has advantage over the nation as a whole in two ways: (1) the Iowa ratio is considerably lower than the national ratio for all three years, indicating better access to optometric services in Iowa than on a national average, and (2) the Iowa ratio was declining whereas the national ratio was increasing, indicating that the availability of optometric services during 1966-68 was improving somewhat in Iowa and diminishing at the national level. Neither of these indications should be regarded, however, as necessarily accurate.

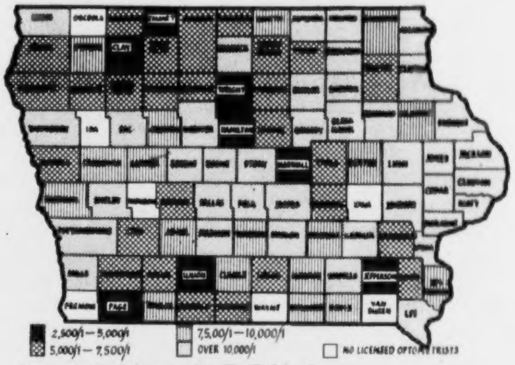
Table 1. Population Per Licensed Optometrist Ratios for the United States and Iowa: 1966-1968[a]

Year	United States	Iowa
1966	9,480	7,699
1967	9,621	7,472
1968	9,719	7,418

[a] Population figures are taken from the *Statistical Abstract of the United States, 1969*. Licensed Optometrist figures are from the *Blue Book of Optometrists*, various issues.

The National Center for Health Statistics has reported that the number of professionally active optometrists in the United States has been relatively constant for many years. An estimated 17,000 licensed optometrists were practicing in the nation in 1967, representing 82.5 percent of the total number of licensed optometrists.[2] The remaining licensed optometrists are retired, employed in other fields, or simply inactive. Figures on the activity status of Iowa's licensed optometrists are not readily available. It may be assumed, though, that both the Iowa and the U.S. ratios in Table 1 are better (lower) than the corresponding ratios for professionally active optometrists.

Map 1. Population per Iowa Optometric Association Member by County: 1968



Source: See Appendix F, Table 1.

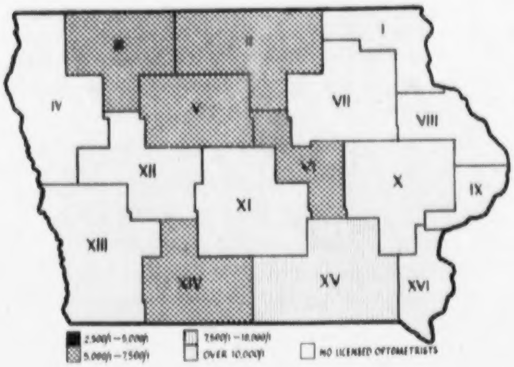
*Map with county identifications of legible size on Page 91, Appendices Section.

The Iowa Optometric Association (IOA) is the state professional organization in optometry. Its membership is limited to licensed optometrists and constituted 71 percent of Iowa's licensed optometrists in 1968. In addition, virtually all members of the IOA are professionally active; so the IOA membership is considered to approximate very closely the state's total number of actively employed licensed optometrists.

Map 1 depicts the 1968 ratios of population per IOA member for the 99 counties in Iowa. Only seven were without any IOA members in 1968. Eight counties had between 2,500 and 5,000 persons per IOA member; 28 had ratios of between 5,000 and 7,500; 18 had ratios between 7,500 and 10,000; and 38 counties had ratios in excess of 10,000 persons per IOA member.

These ranges were designated solely for the purpose of exhibiting distribution and should in no way be interpreted as delineating areas of "adequate" or "inadequate" optometric services. The 1968 population per IOA member ratio

Map 2. Population per Iowa Optometric Association Member by Region: 1968


I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
XVI
2,500/1 – 5,000/1
5,000/1 – 7,500/1
7,500/1 – 10,000/1
OVER 10,000/1
NO LICENSED OPTOMETRISTS

Source: See Appendix F, Table 1.

for the state was 10,464. Fifty-five county ratios fell below that of the state.

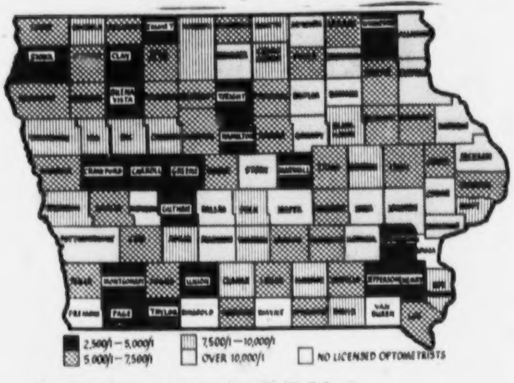
Map 2 indicates 1968 population per IOA member ratios for 16 multi-county regions in Iowa. Over these broader geographical areas, the ratios generally do not compare favorably with those presented at the county level. There are no regional population per IOA member ratios under 5,000 and 10 of the 16 regions exhibit a ratio exceeding 10,000 persons per IOA member.

It should be noted that the 1968 state ratio of 10,464 persons per IOA member is considerably larger than the 1968 state ratio of 7,418 persons per licensed optometrist (shown in Table 1). The former ratio was computed only for those IOA members known to be professionally active during 1968.

Information for 1968 on the number and location of all licensed optometrists in Iowa is available and is summarized in Map 3 in the form of population per licensed optometrist ratios.

Five Iowa counties were without a licensed optometrist in 1968. Nineteen counties had ratios of population per licensed optometrist of between 2,500 and 5,000; 35 had ratios between 5,000 and 7,500; 19 ratios between 7,500 and 10,000; and 21, ratios exceeding 10,000. The state population per licensed optometrist ratio was 7,418. Fifty-one Iowa counties had ratios lower than that.

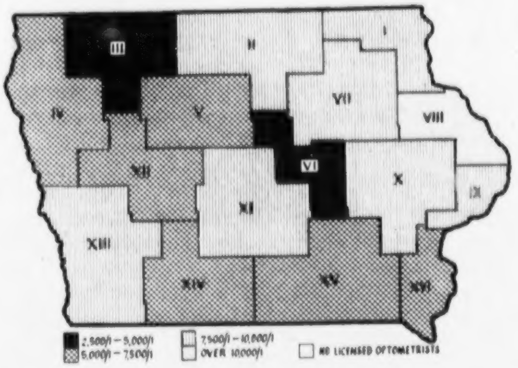
Map 3. Population per Licensed Optometrist for Iowa by County: 1968


2,500/1 – 5,000/1
5,000/1 – 7,500/1
7,500/1 – 10,000/1
OVER 10,000/1
NO LICENSED OPTOMETRISTS

Source: See Appendix F, Table 1.

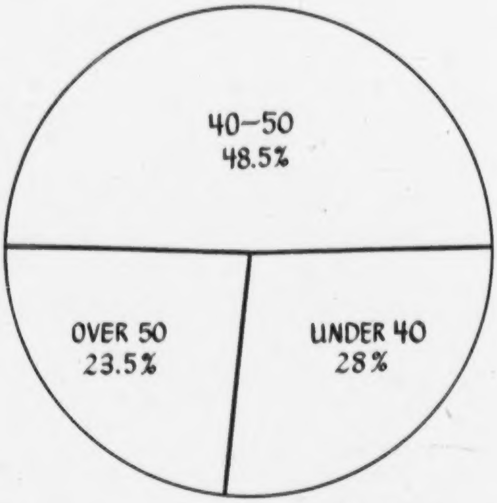
*Map with county identifications of legible size on Page 91, Appendices Section.

Map 4. Population per Licensed Optometrist for Iowa by Region: 1968


I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
XVI
2,500/1 – 5,000/1
5,000/1 – 7,500/1
7,500/1 – 10,000/1
OVER 10,000/1
NO LICENSED OPTOMETRISTS

Source: See Appendix F, Table 1.

Chart 1. Estimated Age Distribution of the Membership of the Iowa Optometric Association



Age Group	% of Membership
Under 40	28%
40-50	48.5%
Over 50	23.5%

Source: Iowa Optometric Association

The 1968 ratios of population per licensed optometrist for the 16 multi-county regions are presented in Map 4. The distribution of licensed optometrists over these broader geographic areas compares favorably with the county distribution. Only one region exhibits a ratio exceeding 10,000 persons per licensed optometrist. However, it must be reemphasized that not all of the licensed optometrists for which these ratios were computed are professionally active.

The estimated age distribution of the membership of the Iowa Optometric Association is presented in Chart 1. The data are based on a 1969 survey of membership. Seventy-two percent of the IOA members are above 39 years of age, despite the fact that it is currently possible to become a licensed optometrist by the age of 25. Without data on other states and for other years, it is not possible to establish whether or not Iowa's optometrists are a relatively aging group.

Data on type of practice, educational background and sex distribution of optometrists in Iowa are not available at this time. However, there appear to be very few women in this health field.

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[1] Most Iowa optometrists have had five years of training consisting of two years of undergraduate work and three years at a college of optometry. All future optometrists will be graduates of a six-year educational program consisting of two undergraduate (liberal arts) years and four years at a college of optometry.

[2] National Center for Health Statistics, *Health Resources Statistics, 1968,* Public Health Service, Washington, D. C.

PHARMACY

Pharmacists are specialists in the science of drugs used in the prevention, diagnosis and treatment of disease. The U.S. Department of Labor estimates that Americans visit their community pharmacists five billion times yearly, approximately equal to a visit by one member of each family each week. This discussion will be primarily concerned with these community pharmacists (i.e., those pharmacists engaged in the actual dispensing of prescriptions in clinics, community pharmacies, and prescription shops). Other pharmacists are employed in teaching and government positions, or as hospital pharmacists and industrial pharmacists.

The number of licenses issued to pharmacists, both in Iowa and the United States, has shown a long-run tendency to increase. Table 1 shows Iowa had 3,189 licenses outstanding in 1968, compared to 2,753 in 1961, representing an overall increase of 15.8 percent. For the United States, the percentage increase was only 1.6; the number of licenses outstanding increased from 175,531 in 1961 to 178,391 in 1968.

However, the number of licenses issued is a poor measure of the number of pharmacists in either state or nation at any point in time, because an individual pharmacist may be licensed to practice in several states besides that in which he actually resides. This fact is also reflected in Table 1.

The actual number of pharmacists holding Iowa licenses and living in Iowa rose from 1,805 in 1961 to 2,001 in 1968, representing an increase of 10.8 percent. Nationally, there was an actual decline in the number of licensed pharmacists over the same time, from 145,105 in 1961 to 131,882 in 1965. Since then the number has risen slowly, to reach 135,905 in 1968 (still below the 1961 level).

In respect to relative change in the number of licensed pharmacists in practice, Iowa again has fared better than the United States. Table 2 shows a breakdown of licensed pharmacists by activity status. The Iowa data are more complete than those for the United States. The number of "active" (i.e., practicing) pharmacists in Iowa increased by 15.1 percent from 1961 to 1968. The comparable U.S. percentage was only 6.3, representing an absolute increase of 7,392 pharmacists between 1961 and 1968.[1]

Charts 1 and 2 present historical ratio trends of population per licensed active resident pharmacist and population per licensed active community pharmacist for Iowa and the United States. In Iowa, the population-per-pharmacist trend for both "active" (see Chart 1) and "community pharmacists" (see Chart 2) was rising between 1961 and 1964. Since then, both ratios have terraced downward to a point below the comparable national ratios in 1968.

The Iowa population-per-active-pharmacist ratio was lower in 1968 than in 1961—1,541 in 1968 compared to 1,778 persons per pharmacist in 1961. As Chart 1 shows, the national trend varied over a narrow range between 1961 and 1968. However, the national ratio of population per active pharmacist was higher in 1968 than

Table 1. Number of Pharmacists Licensed by the State of Iowa, and Licensed to Practice in the United States for Selected Years

	Iowa			United States		
Year	Total Licensed	Total Residents	Total Non-Residents	Total Licensed	Total Residents	Total Non-Residents
1961 [a]	2,753	1,805	948	175,531	145,105	20,426
1964 [b]	2,237	1,525	712	183,832	145,271	38,561
1965 [c]	2,285	1,597	688	170,690	131,882	38,808
1966 [d]	2,903	1,789	1,114	172,635	132,900	39,735
1967 [e]	2,994	1,846	1,148	176,239	135,400	40,839
1968 [f]	3,189	2,001	1,188	178,391	135,905	42,486

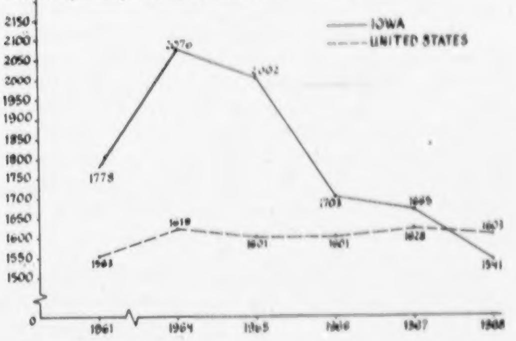
[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 66.
[b] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 67.
[c] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 157.
[d] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 237.
[e] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 131.
[f] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.

Table 2. Activity Status of Licensed Resident Pharmacists for Iowa and the United States for Selected Years

	Iowa			United States		
Year	Total Residents	In-Practice	Not In Practice	Total Residents	In-Practice	Not In Practice
1961[a]	1,805	1,552	253	145,105	117,094[g]	8,335
1964[b]	1,525	1,331	194	145,271	118,284[g]	10,057
1965[c]	1,597	1,379	218	131,882	121,093	10,789
1966[d]	1,789	1,621	168	132,900	122,421	10,479
1967[e]	1,846	1,653	193	135,400	121,529	13,871
1968[f]	2,001	1,787	214	135,905	124,486	11,419

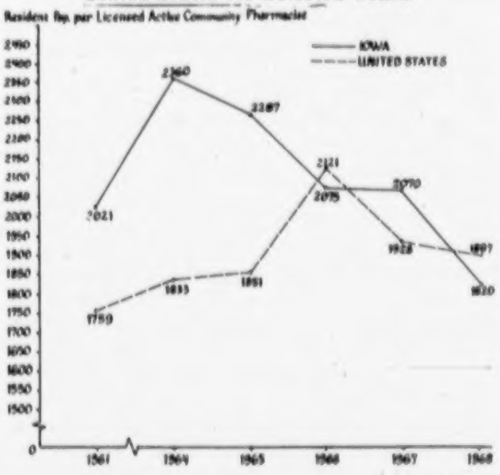
[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 66.
[b] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 67.
[c] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 157.
[d] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 237.
[e] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 131.
[f] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.
[g] Do not sum to total because 10 states did not submit complete information.

Chart 1. Population per Licensed Active Resident Pharmacist for Iowa and the United States for Selected Years.



Source: See Appendix G, Table 1.

Chart 2. Population per Licensed Active Community Pharmacist for Iowa and the United States for Selected Years.



Source: See Appendix G, Table 2.

in 1961—1,563 in 1961 compared to 1,603 persons per pharmacist in 1968.

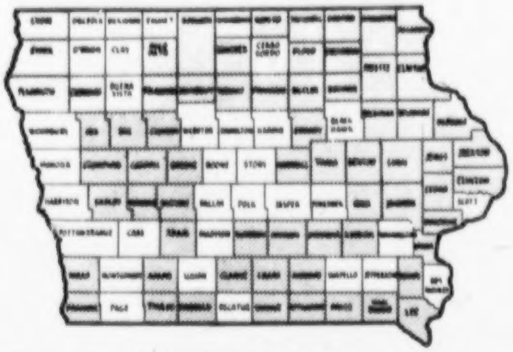
The population-per-community-pharmacist ratio for Iowa began to decline in 1964, while for the United States the descent trend began in 1966. Chart 2 indicates that the rising national ratio reached 1,759 in 1961, peaked in 1966, and the ratio then descended to 1,897 persons-per-community-pharmacist in 1968. In Iowa, the 1961 ratio of 2,021 persons per community pharmacist was surpassed by the 1964 peak of 2,360 persons. The ratio has since declined to the 1968 level of 1,820—below the national ratio.

Just as the ratios of population per community pharmacist in the United States and in Iowa have varied, the ratios vary widely between Iowa regions and counties at any given time. The shaded areas in Map 1 show the regions in Iowa which in 1966 had ratios of population per *full-time* community pharmacist that exceeded the over-all state ratio of 2,286. The county range was from a low of 1,289 in Page County to a high of 9,380 in Van Buren. Table 3 in Appendix G provided the basic data used to construct Maps 1 and 2.

Table 3 presents the 1966 ratios of population per full-time community pharmacist by metropolitan and non-metropolitan county groupings. These groupings are based on the population of the central city in each county. The metropolitan counties each have a central city of 50,000 or more population. The non-metropolitan counties are also grouped according to size of the central city.

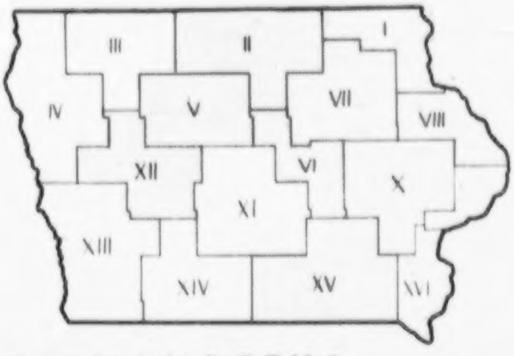
The all-metropolitan county ratio of population per full-time community pharmacist in 1966

Map 1. Population per Full-Time Community Pharmacist for Iowa by County: 1966



Source: See Appendix G, Table 3.

Map 2. Population per Full-Time Community Pharmacist for Iowa by Region: 1966



Source: See Appendix G, Table 3.

was 2,021, somewhat below the state ratio of 2,286 and far below the aggregate non-metropolitan county ratio of 2,454. With the exception of that for Linn County, all the metropolitan county ratios were below the state ratio. This, plus the fact that nearly 39 percent of Iowa's full-time community pharmacists resided in the seven metropolitan counties during 1966, indicates a relatively heavy concentration of these pharmacists in urban areas.

This finding is further borne out by the data in the non-metropolitan county section of Table 3. For non-metropolitan counties with a central city size of 10,000-49,999 population, the ratio of population per full-time community pharmacist was 2,188, still below the state ratio of 2,286. But as the central city size of the non-metropolitan counties decreases, the ratio of population per full-time community pharmacist increases. In those counties with central cities under 2,500 population, each full-time community pharmacist served an average of 3,073 persons.

CHARACTERISTICS OF IOWA'S PHARMACISTS

The picture of pharmacists in Iowa thus far has been a broad one. The following discussion will focus on the employment, sex, age and educational characteristics of Iowa's pharmacists.

Fields of Employment

Tables 4 and 5 present breakdowns of resident pharmacist data by field of employment and activity status for Iowa and the United States. As has already been noted, the number of resident pharmacists in practice in Iowa has been grow-

Table 3. Iowa's Population Per Full-Time Community Licensed Pharmacist by County Group: 1966

	Full-Time Community Pharmacists[b] (1966)	Population[a] (1967)	Population Per Full-Time Community Pharmacist (1966)
All Metropolitan Counties	469	948,180	2,021
Polk	161	272,810	1,694
Linn	56	145,720	2,602
Scott	67	126,010	1,880
Blackhawk	58	125,360	2,161
Woodbury	51	105,650	2,071
Pottawattamie	42	84,510	2,107
Dubuque	34	88,120	2,591
All Non-Metropolitan Counties	735	1,803,820	2,454
Central City Size 10,000-49,999	255	558,060	2,188
5,000-9,999	240	546,920	2,279
2,500-4,999	163	462,200	2,836
Under 2,500	77	236,640	3,073
State Total[c]	1204	2,752,000	2,286

[a] Estimates of Iowa's population for 1967 were provided by the Records and Statistics Division of the Iowa State Department of Health.

[b] Data on Full-Time Community Pharmacist were taken from an unpublished report provided by the Iowa Pharmaceutical Association entitled, "Pharmacy Manpower Report: Report of Number of Pharmacists."

[c] Represents 87.56% of the total Community Pharmacists Licensed and Resident in Iowa in 1966.

Table 4. Iowa's Resident Pharmacists by Field of Employment and Activity Status for Selected Years

Field of Employment and Activity Status	1961[a]	1964[c]	1965[e]	1966[g]	1967[h]	1968[i]
Community Pharmacy	1,365	1,171	1,218	1,375	1,330	1,513
Teaching, Government, and Other Pharmaceutical Capacities	24	19	22	28	111[j]	126
Hospital Pharmacy and Medical Representative	95	88	109	106	114	125
Manufacturing and Wholesaling	68	53	30	112	98	23
Total Active Pharmacists	1,552	1,331	1,379	1,621	1,653	1,787
Unemployed	36[b]	27[d]	28[f]	n.a.	n.a.	n.a.
Retired or Otherwise Employed	217[b]	167[d]	190[f]	n.a.	n.a.	n.a.
Total Inactive Pharmacists	253[b]	194[d]	218[f]	168	193	214

[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 68.
[b] *Ibid.*, p. 66.
[c] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 71.
[d] *Ibid.*, p. 67.
[e] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 163.
[f] *Ibid.*, p. 157.
[g] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 242.
[h] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 136.
[i] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.
[j] Pharmacists acquiring other professional degrees in recent years increased so in number that (starting 1967) they are now included in this category under "other capacities".

ing in recent years. Table 4 shows positive yearly increments in the number of active pharmacists in Iowa since 1964. These increments have been distributed over all of the various fields of employment, with the exception of pharmacists working for manufacturers and wholesalers. In the latter fields, the number employed fell from 53 in 1964 to 23 in 1968.

Between 1964 and 1968, increases occurred in the number of pharmacists working in community pharmacies, in colleges of pharmacy and in government, and in hospitals and as medical representatives. In absolute terms, the field reporting the greatest increase was community pharmacy, where there was a gain of 342 pharmacists between 1964 and 1968. In relative terms, the greatest increase occurred in the combined fields of teaching and government, which showed an increase of 563 percent—from 19 employed in 1964 to 126 in 1968.

The data for the United States are somewhat incomplete, so precise statements about changes over time are not possible (see Table 5). It would appear, however, that as in Iowa some increase occurred in each field of employment.

Approximately 89 percent of Iowa's licensed resident pharmacists were in practice in 1968, compared with about 92 percent for the nation. The real significance of this difference is rather obscure due to information on numbers of "unemployed" not being available for 1968. It is nevertheless interesting to observe that in 1968 the percentage distribution of active pharmacists among the various fields of employment was quite similar for Iowa and the United States.

The major differences between the two percentage distributions are: (1) 7.1 percent of Iowa's pharmacists worked in teaching and government, while only 3.9 percent of the nation's active pharmacists were thus employed; and (2) 1.3 percent of Iowa's pharmacists worked in manufacturing and wholesaling, compared to four percent of the nation's active pharmacists.

Sex Distribution

Table 6 indicates that pharmacy has been, and remains, largely a male profession. The proportion of active pharmacists in 1968 who were women came to only 7.2 percent in Iowa and 8.2 percent nationally.

However, the national trend for the 1960's in-

Table 5. United States' Resident Pharmacists by Field of Employment and Activity Status for Selected Years

Field of Employment and Activity Status	1961[a]	1964[b]	1965[d]	1966[f]	1967[g]	1968[h]
Community Pharmacy	104,092	104,400	104,693	92,372	102,708	105,203
Teaching, Government and other Pharmaceutical Capacity	3,131	3,359	3,899	4,189	4,710	4,876
Hospital Pharmacy and Medical Representative	4,597	5,660	7,978	6,734	9,078	9,428
Manufacturing and Wholesaling	4,599	4,198	4,523	4,496	5,033	4,979
Total Active Pharmacists	116,419††	117,617†	121,093	107,791**	121,529	124,486
Unemployed	2,318	1,836[c]	2,309[e]	n.a.	n.a.	n.a.
Retired or Otherwise Employed	6,019	8,221[c]	8,480[e]	n.a.	n.a.	n.a.
Total Inactive Pharmacists	8,335*	10,057[c] *	10,789[e]	10,479	13,871	11,419

*Underestimated, source incomplete.
**Field of employment data not available for 14,630 pharmacists.
†Field of Employment data not available for 667 pharmacists.
††Field of employment data not available for 675 pharmacists.

[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 68.
[b] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 71.
[c] *Ibid.*, p. 67.
[d] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 242.
[e] *Ibid.*, p. 157.
[f] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 242.
[g] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 136.
[h] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.

dicated a slow rise in the proportion of women pharmacists. Table 6 shows that the percentage of female active pharmacists in the U.S. between 1961 and 1968 increased from 5.4 to 8.2 percent. A similar trend is not clearly present in Iowa, where the percentage has fluctuated. Between 1961 and 1965 it fell from 7.3 to 6.9. It rose from 6.9 to 9.3 between 1965 and 1967, but then fell to 7.6 percent in 1968.

Age Distribution

The age distribution of active resident pharmacists in Iowa closely paralleled that of the United States during the 1961-68 period. Tables 7 and 8 present this distribution for selected years in Iowa and the United States. The cumulative age distributions for both in 1968 are presented on Chart 3.

In 1968, Iowa had greater proportions of active resident pharmacists in the under-40 and over-60 age categories than did the U.S. In that year, 45 percent of Iowa's active resident pharmacists were under 40, the comparable figure for the United States being 42.6. Almost one-fifth —19.8 percent— of Iowa's active resident pharmacists were over 60, compared to the national figure of 18.9.

The steady increase in the percentage of Iowa's active resident pharmacists under 30 years of age has been impressive. Table 7 shows that in 1961 the percentage of Iowa's resident pharmacists under 30 was 14.4, and that this percentage has since increased for each year reported—reaching 24.3 by 1968. The national data, though incomplete, indicates a constant proportion of active pharmacists under 30. In 1968, the United States figure for active pharmacists under age 30 was only 18.7 percent.

Educational Attainment

The educational preparation of Iowa's pharmacists, as for pharmacists across the country, is quite extensive. Current licensing regulations in the United States require a minimum of five years of college education; at least three of these years must be in a college of pharmacy accredited by the American Council on Pharmaceutical Education. Further, most states also require a one-year internship as a prerequisite for licensure, plus the passing of a state board of examination.

Table 6. Sex Distribution of Active Pharmacists in Iowa and the United States for Selected Years

	Iowa		United States	
	Percent Male	Percent Female	Percent Male	Percent Female
1961[a]	92.7	7.3	94.6	5.4
1964	n.a.	n.a	n.a.	n.a.
1965[b]	93.1	6.9	94.6	5.4
1966[c]	91.2	8.8	92.1	7.9
1967[d]	90.7	9.3	91.8	8.2
1968[e]	92.4	7.6	91.8	8.2

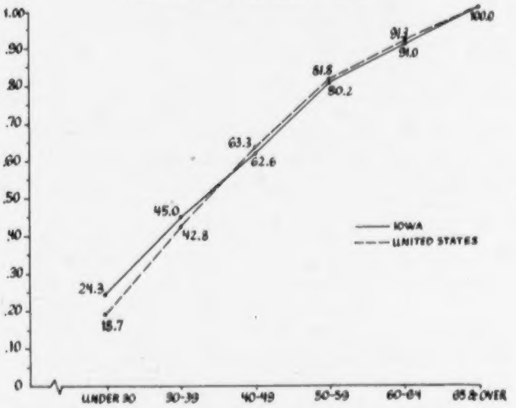
[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 67.
[b] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 161.
[c] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 238.
[d] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 132.
[e] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.

Table 7. Age Distribution of Active Pharmacists in Iowa for Selected Years

	1961[a]		1964[b]		1965[c]		1966[d]		1967[e]		1968[f]	
	%	Cum.[g]	%	Cum.[g]	%	Cum.[g]	%	Cum.[g]	%	Cum.[g]	%	Cum.[g]
Under 30	14.4	14.4	15.4	15.4	16.2	16.2	18.4	18.4	22.7	22.7	24.3	24.3
30-39	23.0	37.4	22.8	38.2	21.5	37.7	22.5	40.9	20.7	43.4	20.7	45.0
40-49	18.8	56.2	18.6	56.8	16.7	54.4	18.9	59.8	18.7	62.1	17.6	62.6
50-59	21.4	77.6	19.3	76.1	18.2	72.6	18.5	78.3	19.5	81.6	17.6	80.2
60-64	6.7	84.3	9.1	35.2	8.8	81.4	9.3	87.6	9.0	90.6	9.4	89.6
65-	15.7	100.0	14.8	100.0	18.6	100.0	12.4	100.0	9.4	100.0	10.4	100.0
	100.0		100.0		100.0		100.0		100.0		100.0	

[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 69.
[b] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 73.
[c] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 165.
[d] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 241.
[e] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 135.
[f] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.
[g] Cumulative per cent.

Chart 3. Cumulative Age Distribution of Active Pharmacists for Iowa and the United States: 1968



Source: See Appendix G, Tables 7 and 8.

The most popular curriculum patterns for pharmacy educations are: (1) one year of pre-professional education, followed by four years of professional education; (2) two years of pre-professional education followed by three years of professional education.

Table 8 shows for selected years the percentages of active licensed pharmacists in Iowa and the United States who graduated from pharmacy programs of varying durations. From these data is it is clear that since 1964 the majority of practicing pharmacists in Iowa and the United States graduated from four-to-six-year programs.

The percentage of active resident pharmacists who were trained "by experience" is understandably decreasing steadily in the United States. This percentage fell from 9.2 in 1961 to 6.4 in 1968. The corresponding figures for Iowa fell from 15.4 in 1961 to 1.1 in 1967, but rose to 5.0 in 1968.

Inspection of the raw data underlying the Iowa portion of Table 9 reveals an increase in the absolute numbers of active pharmacists in each of the four educational categories over the 1967-1968 time period. The largest absolute in-

Table 8. Percentage Distribution of Iowa and United States Active Pharmacists by Years of College Education for Selected Years

	1961[a]		1964[b]		1965[c]		1966[d]		1967[e]		1968[f]	
	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.
By Experience	15.4	9.2	7.1	7.0	4.8	7.3	1.5	6.7	1.1	6.6	5.0	6.4
Grad. of 2 yr Course	36.4	21.8	29.9	13.2	32.7	9.2	29.0	12.5	28.2	12.2	26.5	12.0
Grad. of 3 yr Course	1.4	10.4	.8	11.1	.9	8.9	1.0	10.1	.8	12.5	1.3	12.5
Grad. of 4-6 yr Course	46.8	67.6	62.2	68.7	61.6	74.6	68.5	70.7	69.9	68.7	67.2	69.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, p. 67.
[b] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, p. 69.
[c] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, p. 161.
[d] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, p. 238.
[e] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, p. 134.
[f] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago.

crease occurred in the number of active pharmacists trained "by experience."

SUMMARY

Despite a long-run trend toward more licensed pharmacists, the actual number in the United States was lower in 1968 than at the beginning of the 1960's. In contrast, Iowa had 2,001 resident pharmacists in 1968, more than at any previous time during the 1960's. Over the 1961-68 period, both Iowa and the United States had an increase in the number of active resident pharmacists, the Iowa increase occurring at a rate of 15.1 percent to only 6.3 percent in the U.S.

During the earlier 'sixties, the ratios of population per active pharmacist and per active community pharmacist for the United States were both below the comparable Iowa ratios. But by 1968, the reverse was true. Then there were 1,541 persons per active pharmacist in Iowa to 1,603 in the United States, and 1,820 persons per community pharmacist in Iowa vs. 1,897 in the U.S.

Thus, Iowa's availability of pharmacists per person is favorable compared to that of the nation. However, distribution of Iowa's pharmacists-to-population is by no means equal across the state. Data for 1966 indicate that more full-time community pharmacists per person are located in Iowa's urban areas than in the more sparsely populated ones.

The state's ratio of population per full-time community pharmacist was 2,286 in 1966. The comparable ratio for most of Iowa's metropolitan counties, and for the combined counties with central cities of 10,000 or more population were below this ratio. In contrast, the state ratio was considerably below that for the combined counties with central cities under 10,000 population.

Females constituted only 7.2 percent of the active pharmacists in Iowa in 1968 and 8.2 percent in the United States. However, the general trend for the 1960's indicated that increasingly more women are becoming active pharmacists both in Iowa and the United States. In age distribution of active pharmacists in Iowa and the United States, there is a sharp and noteworthy difference. In 1968, nearly 24.5 percent of Iowa's active pharmacists were under 30 years of age, compared to only 18.7 percent in the nation. These age-distribution percentages form a pattern indicating that as the number of active pharmacists in Iowa and the United States increased during the 1960's, comparatively larger numbers of young pharmacy graduates established themselves in Iowa than in the rest of the nation.

Differences in pharmacy manpower trends between Iowa and the U.S. are sufficient to warrant further investigation. Specifically, what underlying conditions account for these differences in the pharmacy manpower profile?

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[1] The reader should keep in mind the fact that this estimate is probably too high since the 1961 national data on employment status is incomplete.

DENTAL HYGIENE

In addition to dentists, the dental work force consists of three allied occupational groups: dental hygienists, dental assistants and dental laboratory technicians. By simplifying and reducing the number of tasks required of the dentist himself, these auxiliary personnel increase the productive efficiency of the dentists and consequently increase the amount of dental services potentially available.

Even though the technical production relationship of dentists and their dental auxiliaries is unknown, the detailing of characteristics and number of auxiliaries can be helpful as the framework for an analysis of the auxiliaries' importance.

This section presents salient facts about the smallest group of auxiliaries, the dental hygienists. The hygienists are the only dental auxiliaries who provide services directly to the patient. Hygienists assist dentists by performing such tasks as scaling and polishing of the teeth, taking dental X-rays, and applying fluoride solutions to teeth. Like dentists, they are required by each state to obtain a license to practice.[1]

In 1967 there were approximately 15,000 dental hygienists in the United States, compared to 27,000 dental laboratory technicians and 95,000 dental assistants. Nearly 11 percent of all dental auxiliaries were hygienists.[2] In Iowa in 1965, dental hygienists filled 119 of 1,842 dental auxiliary positions—or about 6.4 percent.[3]

CHARACTER OF IOWA DENTAL HYGIENISTS

Hygienists per Dentist Ratios

In 1966 there were 154 resident dental hygienists licensed to practice in Iowa. Of these, 140 responded to the 1966 survey conducted by the Board of Dental Examiners. Table 1 shows that 78 of the 140 respondents were professionally employed and 62 were inactive, i.e., retired or working at a job other than dental hygiene None were unemployed.

These figures are more meaningful when related to the number of practicing dentists in Iowa, and then when compared to the United States as a whole.

Table 2 shows comparable data for Iowa and the United States as to the number of active dental hygienists per 100 active, non-federal dentists for 1965 and 1967. In the United States there were 17.5 dental hygienists for every 100 dentists in 1965 and 16.5 in 1967. The Iowa counts of 9.4 and 6.0 for 1965 and 1967, respectively, were significantly lower. Moreover, although both the state and national ratios declined during the interval 1965 to 1967, the United States level dropped only slightly, while the Iowa ratio fell by more than one-third.

The significance of Table 2 is that — all other things being equal—the average dentist on the national level in 1966 should logically have been more productive than the typical Iowa dentist because of his auxiliary aid. Extending this reasoning, the advantage Iowa had over the nation as a whole after 1965 in terms of population-per-dentist ratio (used an an index of the supply of dental services) may conceivably have been negated by the increased efficiency of the nation's dentists due to their greater use of auxiliary manpower.

These figures and statements should, however be interpreted with caution. "Things" are seldom "equal"; and many other factors influence the "typical" dentist's productivity besides dental hygienists. For example, education, skills, hours worked, capital equipment and business organization are such factors. Additionally, dental hygienists are only a part —and a minor part numerically—of the corps of dental auxiliaries available to the dentist.

Geographic Distribution of Hygienists in Iowa

Differing from the analyses of most health occupations in this volume, this chapter provides no calculation of the ratios of population per dental hygienist. Hygienists are not influenced *directly* by population distribution in their placement, but instead respond to the distribution of denists among the population (dental market size), the demand structure for dental services, and the other factors affecting the production of dental services. The dentist's demand for auxiliary help is *derived* from the consumers' demand for dental services and the dentist's ability to otherwise than personally supply them.

Iowa's dentists are concentrated in the more urbanized areas of the state. *A priori* reasoning suggests that the same factors which caused this distribution would similarly prompt a concentration of dental auxiliaries.

It is likely that there is a relatively higher and more stable effective demand for dental services in the metropolitan counties of Iowa

Table 1. Iowa Licensed Dental Hygienists by Residence and Current Professional Status: 1966[a]

Location & Activity Status	Licensed Hygienists	Percent
Total Licensed	363	100.0
Non-Resident	209	57.6
Iowa-Resident	154	42.4
Iowa Resident	154	. . .
Responded	140	100.0
Active Professionally	78	55.7
Employed[b]	78	55.7
Private Dental Office	67	47.9
Dental Hygiene School	6	4.3
Elementary or Secondary	3	2.1
City or County Health Agency	0	0.0
State Health Agency	1	.7
Other Local Government	0	0.0
Other State Government	2	1.4
Other Federal	2	1.4
Unemployed (i.e., searching for work as a dental hygienist)	0	0.0
Inactive (i.e., neither working nor searching for work as a dental hygienist)	62	44.3
Did not Respond	14	. . .

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[a] May, 1966, Survey conducted by the Iowa Board of Dental Examiners. Hereinafter referred to as *Survey*.

[b] Detail will add to more than total, as several hygienists reported more than one type of employer.

than in the non-metropolitan counties. Moreover, it is likely that at these higher levels of demand (and thus supply) the auxiliary-to-dentist ratio is apt to be larger than where lower levels of demand exist, due to the economic efficiencies expectable from such a combination of human resources. For at higher levels of output, the average cost to the dentist for producing a unit of dental service tends to be lowered by increasing the proportion of auxiliary-to-dentist inputs.

These factors combine, as Table 3 indicates, to attract more auxiliaries, in general—and more dental hygienists, in particular—to the metropolitan counties than to non-metropolitan counties. In 1965, for example, there was an average of 18.2 dental hygienists employed by every 100 metropolitan dentists compared to 3.9 hygienists employed by 100 non-metropolitan county dentists. This pattern holds true for 1966, also.

Table 4 presents the distribution of the 154 licensed dental hygienists residing in Iowa in 1966 by county and activity status. In that year, 42 counties had resident hygienists.

Marital and Sex Status

Table 5 shows that a large majority—82.7 percent—of the reporting dental hygienists in 1966 were married. An additional 4.3 percent had at one time been married.

Table 6 indicates that in 1969, all 124 members of the Iowa Dental Hygienists Association (IDHA) were female. Although the proportion of all Iowa dental hygienists accounted for by the IDHA in 1969 is not known, the organization's membership is known to have constituted 55 percent of the dental hygienists manpower in 1966. It can be safely generalized, therefore, that a very predominantly high proportion of Iowa's dental hygienists are female.

Age Distribution

Dental hygienists in Iowa are in large degree a young group. A full 60 percent of the survey respondents in 1966 were under 30 years of age and 81.5 percent were under 35. Among the active hygienists, 68 percent were under 30 and 78.3 percent under 35. The age distribution data are presented in Table 7.

A significant classification is the 20-34 age bracket. This being the normal child-bearing and rearing age span, the large number within it has important implications as to their availability to the labor force. Since 85.4 percent of Iowa's inactive hygienists were in the 20-34 group, family obligations clearly play an important role in determining the supply of hygienist services offered.

Table 2. Ratio of Active Dental Hygienists per 100 Active Non-Federal Dentists for Iowa and the United States: 1965 and 1967

	Active Dental Hygienists		Active, Non-Federal Dentists		Hygienist per 100 Dentists	
	1965	1967	1965	1967	1965	1967
United States[a]	15,100	15,000	86,317	90,716	17.5	16.5
Iowa	119[b]	78[c]	1,257[d]	1,292[e]	9.4	6.0

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[a] NCHS, *Health Resources Statistics (HRS)* for *1965* and *1968*.

[b] See "Dentistry", Chapter 4, Tables 11 and 12.

[c] See Table 1.

[d] Iowa State Board of Dental Examiners, *1965 Survey of Dentists Licensed in Iowa*.

[e] Iowa Department of Health (Dental Health Division), *A Profile of Iowa Dentists: 1968*, (unpublished data).

Table 3. Selected Active Dental Auxiliary per 100 Dentists Ratios for Iowa by County Group: 1965-66[a]

	1965			
	Active Dentists	Active Auxiliaries	Active Hygienists	Population/ Active Dentist
All Metropolitan Counties	489	836	89	2,000
All Non-Metropolitan Counties	768	1,006	30	2,396
Iowa Total	1,257	1,842	119	2,242

	1966	1965		1965/6[c] years
	Active Hygienists[b]	Auxiliaries per 100 Dentists	Hygienists per 100 Dentists	Hygienists per 100 Dentists
All Metropolitan Counties	39	171.0	18.2	8.0
All Non-Metropolitan Counties	53	131.0	3.9	6.9
Iowa Total	92	146.5	9.5	7.3

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[a] Dentistry, Chapter 4, and Tables 2, 11, 12, in *Survey*.
[b] Fourteen non-reporting dental hygienists are here counted as active.
[c] 1966 Hygienist count and 1965 Dentist count.

Table 4. Licensed Resident Dental Hygienists for Iowa by County by Activity Status: 1966[a]

County	Licensed In-state Hygienists	Respondents Total	Respondents Active	Respondents Inactive
Total	154	140	78	62
Appanoose	1	1	1	- -
*Black Hawk	3	3	2	1
Boone	1	-	-	-
Bremer	1	1	1	-
Calhoun	1	1	-	1
Cass	1	1	-	1
Cedar	1	-	-	-
Cerro Gordo	5	4	1	3
Clinton	4	4	3	1
Dallas	1	1	-	1
Des Moines	2	2	1	1
*Dubuque	2	-	-	-
Emmet	1	1	-	1
Greene	1	1	-	1
Guthrie	1	-	-	-
Howard	1	1	1	-
Humboldt	2	2	1	1
Iowa	1	1	1	-
Jackson	1	1	-	1
Jasper	1	1	-	1
Jefferson	3	3	1	2
Johnson	30	28	18	10
Kossuth	1	-	-	-
Lee	1	1	1	-
*Linn	17	16	7	9
Lyon	1	-	-	-
Mahaska	1	1	1	-
Marion	2	2	1	1
Marshall	3	3	1	2
Muscatine	1	1	-	1
O'Brien	4	3	1	2
Page	1	1	1	-
*Polk	29	28	17	11
*Pottawattamie	2	2	1	1
Poweshiek	1	1	1	-
*Scott	13	13	8	5
Story	4	4	2	2
Warren	2	1	1	-
Webster	2	2	2	-
Winneshiek	1	1	1	-
*Woodbury	1	1	-	1
Worth	1	1	-	1
County not reported	1	1	1	-

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*Counties meeting the latest (1967) definition of Standard Metropolitan Statistical Areas, established by the U.S. Bureau of the Budget, Office of Statistical Standards.
[a] *Survey*.

Table 5. Iowa-Resident Dental Hygienist by Marital Status: 1966

Marital Status	Resident Dental Hygienists	Percent
Single	18	12.9
Married	116	82.7
Divorced, Separated, Widowed	6	4.3
Total Responding	140	100.0
Did Not Respond	14	- -

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[a] *Survey*.

Table 6. Sex Distribution of Dental Hygienists by Membership in IDHA: 1969[a]

	Total	Male	Female
Members	124	0	124
Iowa Resident	115	0	115
Active	93	0	93
Inactive	19	0	19
Student	3	0	3

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[a] Unpublished membership roster provided by Iowa Dental Hygienists' Association.

Table 7. Age Distribution by Activity Status of Licensed, Resident Dental Hygienists for Iowa: 1966[a]

Age Group	Responding Resident Hygienists	Cumulative Percent	Active	Cumulative Percent	Inactive	Cumulative Percent
Total	140	100.0	78	100.0	62	100.0
20-24	31	22.1	24	30.8	7	11.2
25-29	53	60.0	29	68.0	24	49.9
30-34	30	81.5	8	78.3	22	85.4
35-39	6	85.8	2	80.9	4	91.9
40-49	8	91.5	7	89.9	1	93.5
50-64	9	97.9	6	97.6	3	98.4
65-	2	99.3	1	98.8	1	100.0
Not Reporting	1	100.0	1	100.0	0	0.0

[a] *Survey*

Employment Status

Referring again to Table 1, the labor force participation rate for the responding dental hygienists in Iowa in 1966 was 55.7 percent.[1] The bulk of the employed, 86 percent, worked in private dental offices. Lesser numbers were employed as college faculty and by school systems and government. At the national level, also, dental hygienists were primarily employed in private dental offices.

It is important to note that 44.3 percent of the dental hygienists responding to the survey were professionally inactive (see Table 1). The reasons for their inactivity are presented in Table 8. The most important factor, mentioned by 82.3 percent of those inactive, was the conflict of professional responsibilities with full-time family obligations.

This reason for inactivity, in combination with the rather low labor force participation rate, is in agreement with the age, sex and marital data presented. The typical dental hygienist is female, married and young, so it is not surprising that home responsibilities compete strongly with professional work and leisure for her time. Thus, for the inactive hygienists, the economic and psychic benefits derived from labor force participation do not ordinarily offset the costs associated with such work (i.e., home productivity foregone—or the costs of hiring these home services, the cost of transportation, and other such considerations).

Table 8. Iowa-Resident Licensed Dental Hygienists by Reason for Inactivity: 1966[a]

Reason Reported	Inactive Hygienists	Percent
Total	62	100.0*
Full-time Family Obligations	51	82.3
Other Employment	5	8.0
Unable to Find Suitable Hygienist Employment	6	9.7
Prefers Not To Work	13	21.0
Other	15	24.4

*Total adds to more than 100.0 because some hygienists reported more than one reason.

[a] *Survey.*

Among those participating, there exists a marked preference for part-time work. The *Survey* showed that 51 percent of the hygienists employed in private dental offices in 1966 worked less than 32 hours per week. This may have an explanation similar to that provided for those not practicing to any extent, though the margin differentiating the benefits and costs associated with professional work is somewhat less than involved in a "full-time" work week.

Plans to Return to Work

If it is correctly assumed that the high percentage of inactive Iowa dental hygienists in 1966 is due to a combination of marriage, sex, and age characteristics making full-time family obligations more important than employment, then logically there should be a close correlation between this and the number of children in the home—especially pre-schoolers. Moreover, the number and ages of children of inactive hygienists are important factors in forecasting a prospective return to work.

Data in Table 9 offer a rough test of this hypothesis. The labor force participation rate for all dental hygienists in Iowa was 55.7 percent. For those hygienists without dependent children, the rate is 77.4 percent. For hygienists with dependent children of any age, the participation rate drops to 42.5 percent.

The participation rate varies inversely with the age of children until the pre-school phase is completed, between five and six years of age. With children in school full- or part-time, professional work tends to be substituted for work in the home. For those with children all 15 years of age or over, the participation rate is 75 percent compared to 40.2 percent for hygienists with children under age 15.

Attitudes of the inactive hygienists with children—as revealed in the *Survey*—show that by the time the youngest child starts elementary school family responsibilities will have diminished enough to permit a return to active

Table 9. Age of Dependent Children as a Participation Factor for Iowa-Resident Dental Hygienist: 1966

	Total Hygienists	Active	Inactive	Labor Force Participation Rate
Total	140	78	62	55.7%
Without Children	53	41	12	77.4%
With Children	87	37	50	42.5%
With Children Under 15 Yrs.	82	33	49	40.2%
1 Yr. or under	37	14	23	37.8%
2-3 Yrs.	39	13	26	33.3%
4-5 Yrs.	28	5	23	17.9%
6-8 Yrs.	24	5	19	20.8%
9-14 Yrs.	20	9	11	45.0%
With Children 15 & Over *Only*	4	3	1	75.0%

[a] *Survey.*

Note: This is a rough test only. Variables other than dependent children that have been bearing on labor force participation have not been controlled.

Total inactive hygienists' children will add to more than 50 because some hygienists reported more than one child.

work. This would suggest a probable return to labor market participation, once family responsibilities cease to be a major competitor for the hygienist's time.

Just when a re-entry into the labor market might be intended was not made specific by many of the mothers who were inactive in dental hygiene in 1966, but about one-third expressed plans to work at a future date to earn money for their children's college education. As Table 10 shows, nearly 60 percent of those inactive in 1966 were at least "fairly definite" about returning to practice at some time.

Education

Dental hygienists receive at least two years of college training. There are two-year programs leading to either an associate degree or to a certificate of clinical competence. Training required for leadership positions in teaching and public health is provided by the four-year bachelor's degree program in dental hygiene.[5]

Table 10. Iowa-Licensed Inactive Dental Hygienists by Plans to Return to Practice: 1966[a]

Degree of Definiteness About Ever Returning	Inactive Hygienists	Percent
Total	62	100.0
Very Definite	13	21.0
Fairly Definite	24	38.7
Not at all definite	24	38.7
No Comment	1	1.7

[a] *Survey.*

Table 11 shows the distribution of training levels of dental hygienists licensed to practice in the state in 1966 who responded to the survey. The two-year program for certification has always been the most popular avenue of training. In 1966, 67.1 percent of Iowa dental hygienists had received their training in this manner.

Bachelor's degrees were held by 30.8 percent of those reporting, and associate degrees by 2.1 percent.

The table also shows a marked trend toward a bachelor's degree as the source of a hygienist's education. Of those trained after 1960, 47.5 percent held bachelor's degrees compared to 50.9 percent with certificates. The number of hygienists earning a bachelor's degree since 1960 was more than double the number trained in the four-year program between 1955 and 1960.

Most dental hygienists resident in Iowa received their formal training at the University of Iowa. Table 12 presents a breakdown of Iowa's dental hygienists by school of training. Of the 140 respondents to the 1966 survey, 75 percent held degrees or certificates from Iowa. Northwestern and the University of Minnesota were popular also, with 7.0 and 6.4 percent respectively.

SUMMARY

Dental hygienists constitute only a small proportion of the dental auxiliary field which, with dentists, makes up the dental work force. Because hygienists supply services directly to the patient, such as scaling and polishing teeth, they are licensed in all states.

Table 11. Iowa-Resident Licensed Dental Hygienists by Level and Date of Training: 1966[a]

		By Level of Training					
Year	Dental Hygienists	Bachelor Degree	Percent	Associate Degree	Percent	Certificate	Percent
Total	154	..	..	..	..	..	
Responding	140	43	30.8	3	2.1	94	67.1
After 1960	61	29	47.5	1	1.6	31	50.9
1955-60	53	13	24.5	1	1.9	39	73.6
Before 1955	25	1	4.0	1	4.0	23	92.0
Date Not Reported	1	0	0.0	0	0.0	1	100.0

[a] *Survey.*

Table 12. Iowa-Resident Dental Hygienists by Source by Training: 1966[a]

School	Resident Dental Hygienists	Percent
Total	154	..
Did Not Respond	14	..
Respondents	140	100.0
With formal academic training	140	100.0
University of Iowa	105	75.0
University of Minnesota	10	7.0
Northwestern University	9	6.4
Marquette University	5	3.7
Other	11	7.8

[a] *Survey.*

The key factor in the geographical distribution of dental hygienists is the distribution of dentists, rather than population distribution—plus the resulting demand structure for dental services and the demand for dental auxiliary services *derived* from the demand for dental services and the dentists' ability to otherwise than personally supply those services.

The ratio of active hygienists per 100 active dentists in 1966 was lower in Iowa than for the rest of the nation, and this gap appears to be widening. In Iowa, dental hygienists are concentrated in the metropolitan counties as opposed to non-metropolitan counties. This may be partially explained by the relatively high and more stable demand for dental services there, in combination with certain properties of the dentist's production function.

There are clear indications that practically all of Iowa's dental hygienists are women. About 83 percent of the state's dental hygienists are married; as a group they are relatively young, with 60 percent being under 30 and about 82 percent in the child-bearing and rearing span of 20-34 years old. In combination, these characteristics depress the labor force participation of dental hygienists. Those with pre-school children have a participation rate less than one-half that of those without children.

Dental hygienists must have at least two years of college education to be certified. Increasingly, hygienists are choosing a four-year bachelor's program for training because of its advantages for career advancement. If present trends continue, a majority of Iowa's dental hygienists will have B.S. degrees in the near future. In 1966, 75 percent of the resident hygienists had received their college training at the University of Iowa.

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[1] National Center for Health Statistics (NCHS), *Health Resources Statistics 1968* (Washington, 1968), p. 60.

[2] *Ibid*, p. 59.

[3] See Dentistry, Chapter 4, Tables 11 and 12.

[4] The labor force participation rate is defined as the number of employed dental hygienists to the total number of hygienists multiplied by 100.

[5] *HRS 1968*, p. 61.

DIETETICS

"Dietetic and nutritional services deal with the application of the scientific principles of nutrition to the feeding of individuals and groups. Dietitians assume major responsibility for food selection, preparation, and management of food services. Nutritionists engage in investigating and solving problems of nutrition for the promotion of health."[1]

Department of Health, Education and Welfare estimates of the number of persons employed as both dietitians and nutritionists have remained fairly constant in recent years. Estimates of roughly 30,000 employed in the nation are reported for 1964 and 1967. A large majority of these persons are dietitians: only about 1,000 are nutritionists. The college major for both groups is generally home economics, with special emphasis on food and nutrition and-or institution management. Differences in academic and work experience differentiate between the two professions.

Dietitians

A dietitian plans and directs a food service program in an agency or institution such as a public or private school, a hospital or restaurant. The dietitian's responsibilities may include planning menus and special diets that meet nutritional requirements for health or medical treatment, directing personnel who prepare and serve the meals, managing purchases and accounts, and providing nutritional guidelines for the selection of food.

There are five recognized types of dietitians, differentiated according to type of employment. Administrative dietitians are most numerous; they manage food service programs such as those of large hospitals, schools and commercial food services. The therapeutic dietitian is employed primarily by hospitals to design special diets prescribed by physicians and to instruct patients and their families on how to meet particular food needs.

The services of a dietary consultant are used by child care hospitals, nursing homes and schools. The teaching dietitian conducts educational programs in dietetics, nutrition and institution management for dietetic interns, nursing students and other personnel. The research dietitian may be any of the above specialists engaged in research pertaining to dietetics.

Nutritionists

A nutritionist plans and conducts programs relating food to health, interpreting and evaluating food and nutrition information.

Three types of nutritionists are recognized. A public health nutritionist is responsible for the nutrition component of health programs, consults with professional workers, and participates in research studies. Teaching nutritionists participate in educational programs for professional workers and for the public; they also act as advisors to agency administrators and county home economists through the Federal Extension Service, and to business through consumer education programs. A research nutritionist is concerned with the interrelationship of nutrients in food and their effects on health.

The American Dietetic Association (ADA) is a national professional organization for dietitians and nutritionists. Membership requirements are: (1) a B.S. degree from an approved college or university in dietetics, or foods and nutrition; (2) an approved dietetic internship or three years of professional experience. Dietitians are not licensed by the state of Iowa.

Membership in the ADA serves as a standard of (professional) qualification. The ADA became a registration agency July 1, 1969, and will begin administering registry examinations nationally in 1970. To remain registered, a dietitian will be required to complete 75 hours of study every five years.

Nutritionists usually must receive both undergraduate and graduate level academic training to become a public health nutritionist. The American Public Health Association recommends an advanced degree in nutrition.

"Nutrition workers are found in many professional societies, in addition to the American Dietetic Association. Over 1,000 research scientists who are actively concerned with the chemistry, physiology, or some other aspect of nutrition belong to the American Institute of Nutrition. Nutritionists are largely found within three sections of the American Home Economics Association: the Health section, the Food and Nutrition section, and the Institution Administration section. Many public health nutritionists, food technologists, nutrition educators, and other interested persons belong to the Food and Nutrition section of the American Public Health Association."[2] Data on Iowa members of these professional associations was not readily available.

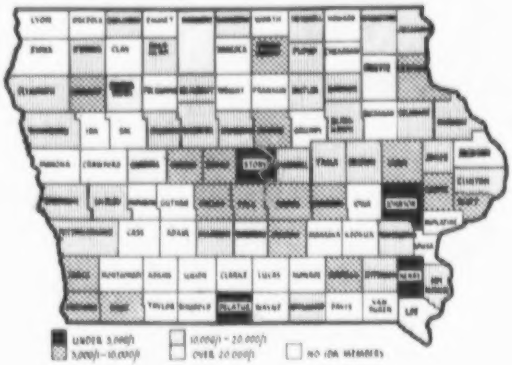
The American Dietetic Association reported that of its 19,660 members in 1967, approximately 7,165 were not seeking work. Chart 1 depicts the percentage distribution of employed ADA members in 1967 by employer and type of activity.

Sixty-four percent were administrative and therapeutic dietitians in hospitals and clinics, eight percent were employed in college and school food service, 12 percent were consultant, research or teaching dietitians, six percent were public health, research or teaching nutritionists, and 10 percent were engaged in miscellaneous activities, including the restaurant business and full-time graduate study.

These percentages were fairly stable for the period 1965-1967,[1] and are believed to fairly represent the percentage distribution of ADA members in Iowa by employer and type of activity.

The Iowa Dietetic Association (IDA) is the statewide professional organization of dietitians and nutritionists. All IDA members are ADA members. In mid-1969 nearly 52.5 percent of the IDA membership was employed on a full-time basis, 6.2 percent on a part-time basis and about 12.3 percent as consultants. This made approximately 71 percent of the IDA members professionally active.

Map 1. Population per Iowa Dietetic Association Member by County: 1969



Source: See Appendix H, Table 1.

***Map with county identifications of legible size on Page 91, Appendices Section.**

Map 1 depicts ratios of population per IDA member for the 99 Iowa counties (See Appendix H, Table 1). Data were not available for the county distribution of *employed* IDA members, so total Iowa resident IDA membership figures used in the computations.

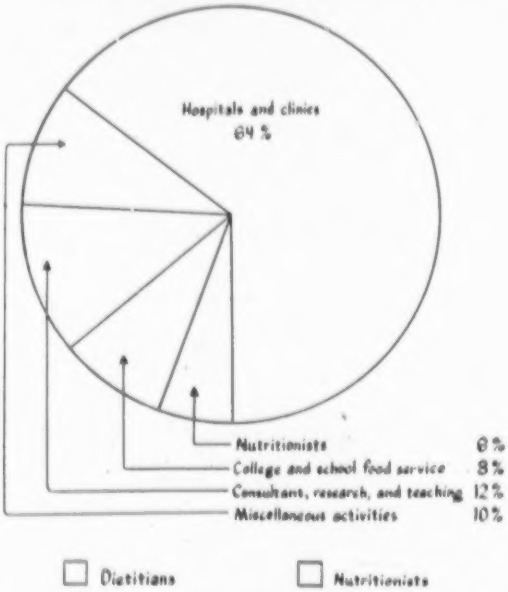
There are 38 counties for which no IDA members were reported. Four counties had ratios of population per IDA member under 5,000; 18 counties had ratios between 5,000 and 10,000; 32 counties had ratios between 10,000 and 20,000; and seven, ratios exceeding 20,000. These ratios must be used carefully.

A large majority of dietitians are employed by hospitals, clinics, colleges or schools. Distribution of these institutions by number and size is important to any direct comparison of county ratios. It must be also remembered that these ratios were computed on the total of Iowa resident IDA members, of whom only 71 percent are employed.

Ratios of population distribution per IDA members for the 16 multi-county regions of Iowa are presented in Map 2. Two regions hvae ratios under 5,000, one region has a ratio between 5,000 and 10,000, eight regions have ratios between 10,000 and 20,000, and five have ratios exceeding 20,000. The state ratio is 8,494.

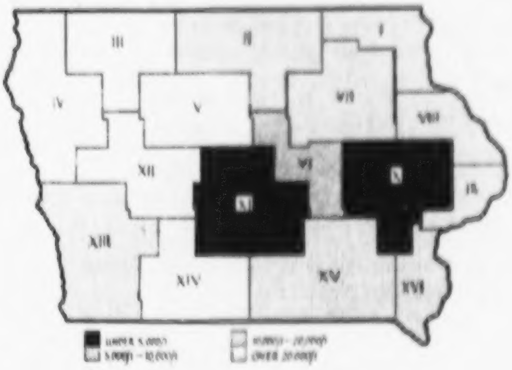
Some persons employed in Iowa as dietitians belong to neither the ADA nor the IDA. The number is not known, and there is little information about their academic background or professional experience. But there are other factors which preclude a concrete description of the present manpower situation in Iowa in this health field.

Chart 1. Percentage Distribution of Employed American Dietetic Association Members by Employer and Activity Status: 1967



Source: National Center for Health Statistics. *Health Resources Statistics, 1968.* Public Health Service, Washington, D.C.

Map 2. Population per Iowa Dietetic Association Member by Region: 1969


III
II
I
IV
V
VII
VIII
XII
VI
X
XI
IX
XIII
XIV
XV
XVI
UNDER 5,000
5,000 - 10,000
10,000 - 20,000
OVER 20,000

Source: See Appendix H, Table 1.

This study reports only highly qualified personnel, since the academic and the professional experience requirements for membership in the ADA are high. The statistics may underestimate, however, the number of qualified personnel.

The number of professionally inactive individuals who have let their ADA membership lapse may be very large, in view of the predominance of women in the profession. Men account for only 2.16 percent of the IDA membership. For the same reason, the number of persons professionally active may be considerably smaller than the figures assume.

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[1] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D.C.

[2] *Ibid.*

[3] *Ibid.*

MEDICAL TECHNOLOGY

The term "medical technologist" is often loosely used to refer to persons who work in a clinical laboratory. Actually, laboratory personnel ranges in educational training from the clinical pathologist to the laboratory assistant whose formal education ended with high school.

The medical technologist, *per se*, works directly under the supervision of a physician as a fact-finder. This job involves, for example, counting and differentiating types of blood cells, making chemical tests of body fluids, preparing tissue specimens, and so forth.

Preparation to perform these tasks requires a minimum of three years of college, followed by one year of specialized training in a school of medical technology accredited by the AMA Council on Medical Education in collaboration with the American Society of Clinical Pathologists' (ASCP) Board of Schools of Medical Technology.

The Board of Schools is composed of clinical pathologists representing not only ASCP, but also the American Society of Medical Technologists (ASMT).

Many medical technologists have a baccalaureate degree, and some have advanced degrees. A person satisfying these educational requirements may take the national certification examination given by the Board of Registry of Medical Technologists (ASCP). The successful completion of this examination permits the use of the professional designation of MT (ASCP).[1]

Members of a closely allied group, cytotechnologists, are trained to detect abnormalities and changes in tissue cells. Some medical technologists specialize in cytotechnology. Most cytotechnologists, however, are less extensively trained than medical technologists.

The minimum educational requirements for a cytotechnologist include two years of college, followed by a minimum of six months in an AMA-approved school of cytotechnology and six months' training in a cytology laboratory. Certification examinations are administered by the Board of Registry of Medical Technologists (ASCP). Successful completion permits the use of the initials CT(ASCP).[2]

The minimum educational requirements for the histologic technician and the certified laboratory assistant include the completion of high school. In addition, the histologist must complete one year of specialized training in a clinical pathology laboratory, and the "lab assistant" must complete one year at an approved school for certified laboratory assistants.

The histologist specializes in cutting and staining blood tissues. The certified (as well as non-certified) laboratory assistant performs routine laboratory procedures under the supervision of a medical technologist. Certified histologists use the initials HT(ASCP), and certified laboratory assistants are designated by the letters CLA.[3]

Data on the number and characteristics of Iowa's medical technologists, cytotechnologists, histologists, certified and non-certified laboratory assistants appear not to be available. The only central source of data on medical technologists is the Iowa Society of Medical Technologists (ISMT). This organization maintains records on its members; many of them belong to the society because of professional interest and their own standing. Members are not, though, necessarily medical technologists. The state of Iowa does not license medical technologists.

CHARACTERISTICS OF ISMT MEMBERS

The data presented below grossly underestimate the number — and consequently may distort the characteristics — of medical technologists in Iowa as they refer only to the membership of the Iowa Society of Medical Technologists.

Table 1 presents summary information about the ISMT's membership. It shows that of the society's 301 members, only 201—or 66.77 percent—are non-students and that 100 are student members.

Geographic Status

Map 1 presents the number of non-student ISMT members by multi-county regions in Iowa. All the regions have at least one member. Membership ranges from a low of one in Region II to a high of 48 in Region XI.

Marital and Sex Status

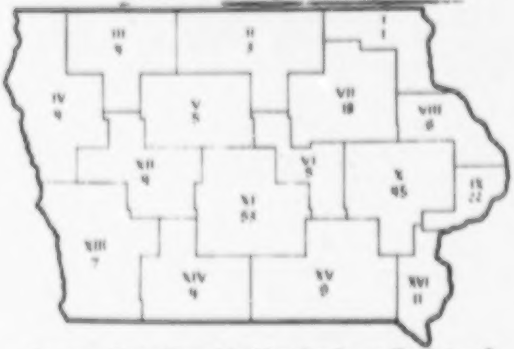
Table 2 discloses that a majority—over 58 percent—of the ISMT non-student members as of July, 1970, were married; 35.82 percent were single, 3.48 percent were divorced, 2.00 percent were widowed, and .50 percent separated.

Table 1. Percentage Distribution of ISMT Membership by Student, Non-Student Status: July, 1969*

Membership Status	Number	Percent
Student Member	100	33.23
Non-Student Member	201	66.77
Total	301	100.00

*Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Map 1. Non-Student ISMT Members in Iowa by Region: 1970



Source: Data Provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Table 2. Percentage Distribution of ISMT Non-Student Membership by Marital Status: July, 1970*

Marital Status	Number	Percent
Single	72	35.82
Married	117	58.20
Divorced	7	3.48
Separated	1	.50
Widowed	4	2.00
Total	169	100.00
Marital Status not Reported	5	

*Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Table 3 shows the distribution of ISMT non-student members by sex. In July 1970, more than three out of four of the ISMT non-student members were women.

Education Status

Table 4 shows the various levels of educational attainment by ISMT members. Of the total membership, 54.50 percent have college degrees ranging from the associate to a master's degree. Slightly over 81 percent of the ISMT's non-student members hold college degrees.

Table 3. Percentage Distribution of ISMT Non-Student Membership by Sex: July, 1970*

Sex	Number	Percent
Male	48	23.89
Female	153	76.11
Total	201	100.00

*Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Probably this percentage distribution should not be generalized to the state's total endowment of medical technologists, because full voting and office holding privileges in the ISMT favor those with college degrees.

Employment Status

A large majority of the ISMT non-student members in July 1970 were employed. Table 5 indicates that 83.08 percent worked full-time, 9.95 percent part-time, and the remainder were either unemployed or their employment status was not reported.

Table 4. Percentage Distribution of the ISMT Membership by Level of Educational Attainment: July, 1970*

Educational Attainment	Number	Percent
Student Members	100	33.23
Members without Degrees	37	12.27
Members with Degrees	164	54.50
Total Members	301	100.00
Associate Degree	4	2.44
Bachelor Degree	150	91.46
Master of Arts	2	1.21
Master of Sciences	8	4.89
Doctor of Philosophy	0	0.00
Total	164	100.00

*Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Most of the employed non-student ISMT members worked in hospital laboratories, the total being 76.97 percent (Table 6); and 7.85 percent were employed by private laboratories. Smaller percentages worked in college-university settings, medical foundations and public laboratories.

The various job titles of employed ISMT non-student members are reported in Table 7. Note that 69 ISMT members worked as medical technologists, while another 35 were employed as chief medical technologists.

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[1] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D.C.

[2] *Ibid.*

[3] *Ibid.*

Table 5. Percentage Distribution of the ISMT Non-Student Membership by Employment Status: July, 1970[a]

Employment Status	Number	Percent
Full-Time Employed	167	83.08
Part-Time Employed	20	9.96
Unemployed or Employment not Reported	14	6.96
Total	201	100.00

[a] Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Table 6. Percentage Distribution of the Employed ISMT Membership by Place of Employment: July, 1970[a]

Place of Employment	Number	Percent
Hospital	147	76.97
Public Laboratory	3	1.57
College-University	11	5.70
Private Laboratory	15	7.85
Armed Forces	1	0.50
Public School	0	0.00
State Board of Health	1	0.50
Medical Foundation	4	2.00
Industry	0	0.00
Miscellaneous	9	4.92
Total	191	100.00

[a] Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

Table 7. Number of ISMT Non-Student, Employed Members by Position: July 1970[a]

Position	Number	
Administrative Technologist	1	
Administrator	1	
Assistant Chief Medical Technologist	1	
Assistant Scientist	1	
Assistant Supervisor	1	
Bacteriologist	4	
Blood Bank Technologist	2	
Chemistry Department Supervisor	1	
Chief Bacteriology	1	
Chief Histologist	1	
Chief Medical Technologists	35	
Chief Microbiologist	1	
Co-Director	1	
Coordinator of Educational Services	1	
Cytotecholologist	1	
Department Head	4	
Director of Laboratories	2	
Hematologist	1	
Hematology Supervisor	2	
Instructor	3	
Laboratory Supervisor	4	
Laboratory X-ray Technologist	1	
Medical Technologist	69	
Microbiologist	5	
Serologist	1	
Serologist Supervisor	1	
Staff Technologists	7	
Supervisor	12	
Teaching Supervisor	8	
Miscellaneous	6	
Technologists[b]		181
Chief Histologist	1	
Laboratory Technicians	3	
Laboratory Assistants	2	
Assistants and Technicians[c]		6
Positions not Reported	14	14
Non-Student Total		201

[a] Data provided by the Iowa Society of Medical Technologists, Des Moines, Iowa.

[b] Persons with at least a Bachelor's Degree, or 3 years of college and 12 months of training in AMA and ASCP approved schools.

[c] Persons without a college degree. Includes persons trained in the Armed Forces, commercial schools, on the job, or in AMA approved schools for cytotechnologists.

OCCUPATIONAL THERAPY

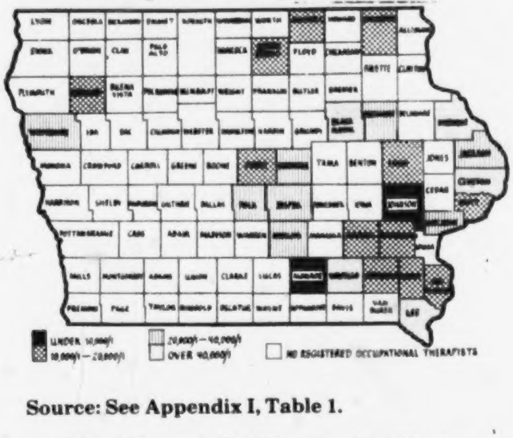
Occupational therapy makes use of purposeful activity in the treatment of physical or emotional disability. Treatment programs are designed on an individual basis, the general objective being to develop a maximum ability to function independently—socially, physically, and-or emotionally—with a view toward future job training and employment.

The Department of Health, Education and Welfare reported there were approximately 8,300 registered occupational therapists in the United States in 1967. The number of persons employed as occupational therapists had increased from approximately 2,000 in 1950 to more than 6,500 in 1967.

About two-thirds were employed in hospitals, with large numbers working in Federal installations. Therapists are also employed in rehabilitation centers, nursing homes and homes for the aged, schools and camps for handicapped children, and in teaching and research institutions.

Occupational therapists are not licensed by the state in Iowa. The American Occupational Therapy Association does, however, act as the registry agency nationwide. To qualify for the national registry examination, an applicant must have completed one of the following educational programs: (1) A four-to-five-year-undergraduate curriculum leading to a B.A. degree in occupational therapy; or (2) for persons holding a B.A. in a field other than occupational therapy, either a two-year graduate curriculum leading to an M.A. degree at the first professional level, or a one-year certificate course.

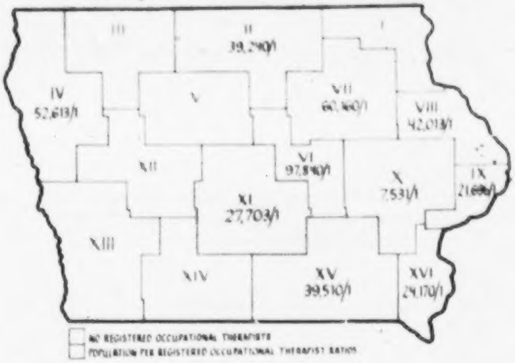
Map 1. Population per Registered Occupational Therapist in Iowa by County: 1969



Source: See Appendix I, Table 1.

***Map with county identifications of legible size on Page 91, Appendices Section.**

Map 2. Population per Registered Occupational Therapist in Iowa by Region: 1969



Source: See Appendix I, Table 1.

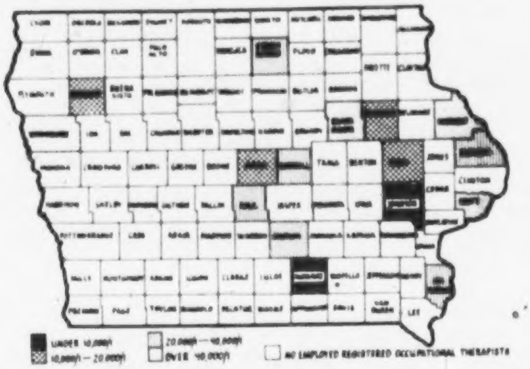
Most registered occupational therapists are graduates of the B.A. program; the number of certificate course graduates is on the decline. In addition to the academic requirement, an applicant must have had a minimum of six months' supervised experience, such as a clinical internship, as a part of his professional education. Upon passing the examination, the applicant becomes a Registered Occupational Therapist (OTR).

According to the Iowa Occupational Therapy Association, there are 94 registered occupational therapists in Iowa. One of them is retired. Map 1 presents the 1969 ratios of distribution of population per registered occupational therapist for the 99 Iowa counties. There are no registered occupational therapists reported for 72 counties. Two counties have ratios of less than 10,000 persons per registered occupational therapist; 12 have ratios between 10,000 and 20,000; eight counties have a ratio between 20,000 and 40,000; and five, a ratio over 40,000.

Population per registered occupational therapist ratios are presented for the 16 multi-county regions of Iowa in Map 2. Six regions reported no registered occupational therapists. Ratios for the remaining 10 regions are indicated on the map. They range from 7,531 in Region X to 97,840 in Region VI. The state ratio is 29,591.

Not all registered occupational therapists are

Map 3. Population per Employed Registered Occupational Therapist in Iowa by County: 1969


UNDER 10,000/1
10,000/1 — 20,000/1
20,000/1 — 40,000/1
OVER 40,000/1
NO EMPLOYED REGISTERED OCCUPATIONAL THERAPISTS
LEE

Source: See Appendix I, Table 1.

*Map with county identification of legible size on Page 91, Appendices Section.

professionally active. Of the 93 non-retired OTR's in Iowa, only 56 are employed. The current manpower situation is more accurately depicted by ratios computed for practicing OTR's. The distribution ratios of population per employed OTR in Iowa by county are presented in Map 3.

No employed OTR's are reported for 83 counties. Two counties have a ratio of persons per employed OTR under 10,000; four counties, ratios between 10,000 and 20,000; six counties, ratios between 20,000 and 40,000; and four counties, ratios exceeding 40,000.

Similar population per employed OTR ratios are presented by multi-county Iowa areas in Map 4, for six of which no employed OTR's are reported. Ratio variations range from 11,586 in Region X to 158,040 in Region XV. The state ratio for employed OTR's is 49,143—very considerably higher than the state ratio for all OTR's.

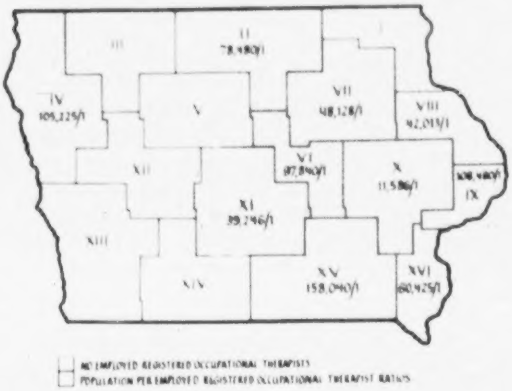
Available information on the sex distribution and employment status of OTR's in Iowa is summarized in Table 1. A preponderance of women in this health field probably accounts for the high proportion of professionally inactive OTR's in Iowa—39.8 percent.

Table 1. Activity Status and Sex Distribution of Registered Occupational Therapists in Iowa: 1969 [a]

	Male		Female		Total	
	No.	%	No.	%	No.	%
All OTR's	9	9.7	84	90.3	93	100.00
Employed OTR's	9	16.0	47	84.0	56	100.00

[a] Iowa Occupational Therapy Association.

Map 4. Population per Employed Registered Occupational Therapist in Iowa by Region: 1969


I
II
78,480/1
III
IV
105,225/1
V
VI
87,840/1
VII
48,128/1
VIII
42,015/1
IX
108,480/1
X
11,586/1
XI
39,296/1
XII
XIII
XIV
XV
158,040/1
XVI
60,425/1
NO EMPLOYED REGISTERED OCCUPATIONAL THERAPISTS
POPULATION PER EMPLOYED REGISTERED OCCUPATIONAL THERAPIST RATIOS

Source: See Appendix I, Table 1.

Twenty separate institutions employ registered occupational therapists in Iowa—three Federal agencies employing 15 percent of this group, eight state agencies employing 40 percent, and nine private institutions employing 45 percent.

Not all employed occupational therapists in Iowa are registered. Data on these non-registered individuals are not available, so it is not known what percentage of them meet the academic and practical experience criteria for registration.

The occupational therapy assistant or technician assists the therapist in carrying out rehabilitation programs for patients in hospitals or other health care facilities. An estimated 4,500 to 5,500 occupational therapy assistants were employed in the nation in 1968.[2] No figures are available on the number employed in Iowa.

The occupational therapy assistants are trained in programs conducted by hospitals, health agencies, vocational and adult education schools and community colleges. Upon graduation from a school approved by the American Occupational Therapy Association, an assistant is certified and eligible for membership in the AOTA.

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[1] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D.C.

[2] *Ibid.*

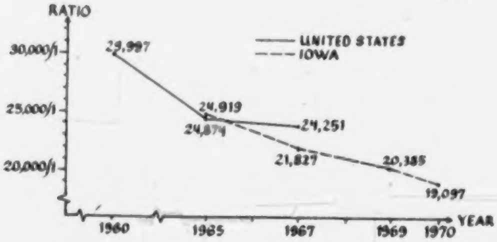
PHYSICAL THERAPY

Physical therapy is a profession which develops and directs programs for the care of individuals whose ability to function is threatened or impaired by disease, injury, or loss of a bodily part. Physical therapy focuses on debilities related to the neuro-musculoskeletal, pulmonary, and cardiovascular systems. The therapeutic process encompasses the use of exercise, heat, cold, electricity, ultrasound, and massage.

Physical therapy incorporates a broad spectrum of activities, such as direct patient care, consultation, research and community services. The physical therapist accepts responsibility for education and administration, for recruiting personnel, setting professional and ethical standards of practice, supervising assistants and aides, and for the welfare of patients.

State licensing of physical therapists in Iowa originated in 1965. To obtain a license, a therapist must hold a degree or certificate from a school of physical therapy and must have passed a state board examination.[1] Under certain conditions, however, it is possible for a physical therapist to obtain an Iowa license by interstate endorsement.

Chart 1. Population per Practicing APTA Member for Iowa and the United States: 1960-1970



Source: See Appendix J, Table 1

The American Physical Therapy Association (APTA) is the national professional organization for physical therapists. To be eligible for APTA membership, a therapist must graduate from a school of physical therapy whose curriculum has been approved jointly by the APTA and the Council of Medical Education of the American Medical Association.

An estimated two-thirds of the nation's work force of physical therapists are professionally active members of the APTA, and data from this source are available for recent years. In Chart 1, a comparison of the national and Iowa ratios of population per practicing APTA member is shown for selected years between 1960 and 1970. It illustrates that since 1965 Iowa has had (1) a lower ratio than the nation as a whole, and (2) a ratio which has been dropping at a faster rate than the nation's over the last five years.[2]

The Iowa Chapter of the APTA compiled a March 1970 listing of its members, and a July 1969 listing of non-APTA members licensed to practice physical therapy in Iowa. From these two lists, it is estimated that during the first quarter of 1970 there were 231 Iowa residents licensed to practice physical therapy in the state.

Table 1 shows that 170, or about 73 percent, of the resident Iowans licensed to practice physical therapy were APTA members. Of these, 142 were employed either on a full- or part-time basis. Further, two out-of-state residents, but licensed by Iowa and members of the Iowa Chapter of the APTA, reported that they worked in Iowa.

From this it is estimated that as of March 1970 there were at least 144 physical therapists employed in Iowa. No doubt some of the non-APTA members noted in Table 1 were also employed, but employment information on these individuals is not available.

Table 1. Licensed Physical Therapists Residing in Iowa by APTA Status: 1970[a]

	Number	Active in Practice
Iowa Resident		
APTA Member	170[b]	142[c]
Non-APTA Member	61	n.a.
Total	231	142

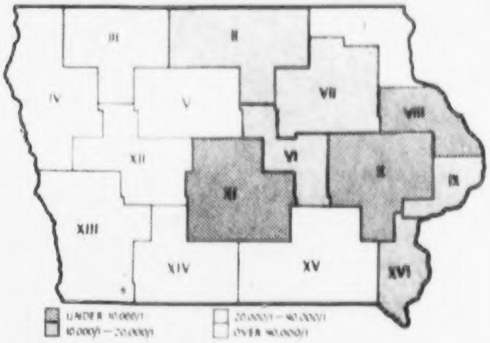
[a] Raw data provided by the Iowa Chapter, American Physical Therapy Association.

[b] This estimate excludes 10 "inactive" members of the Iowa Chapter of the APTA whose "home addresses" were not reported. It includes, however, five "retired," four "student," and two physical therapists who were on military duty.

[c] This estimate includes six physical therapists who were working part-time in March 1970.

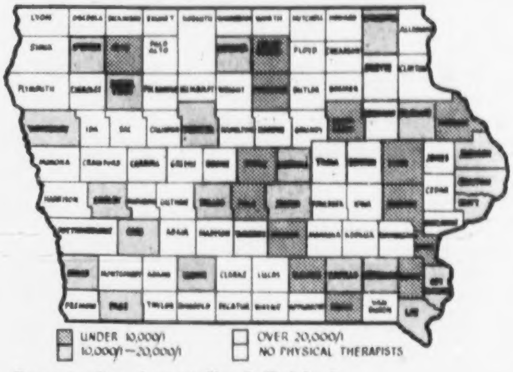
Data presented in the first column of Table 1 underlie the ratios of population per physical therapist used in compiling Map 1. Only three out of Iowa's 16 multi-county regions had a ratio of fewer than 10,000 persons per physical therapist in the early part of 1970. Five regions had ratios between 10,000 and 20,000 persons per physical therapist; and four had between 20,000 and 40,000 per physical therapist. Four of the Governor's Office of Planning and Programming regions had over 40,000 persons per licensed physical therapist.

Map 1. Population per Licensed Physical Therapist for Iowa by Region: 1970


III
II
IV
V
VII
VIII
XII
VI
X
XI
IX
XIII
XIV
XV
XVI
UNDER 10,000/1
10,000/1 — 20,000/1
20,000/1 — 40,000/1
OVER 40,000/1

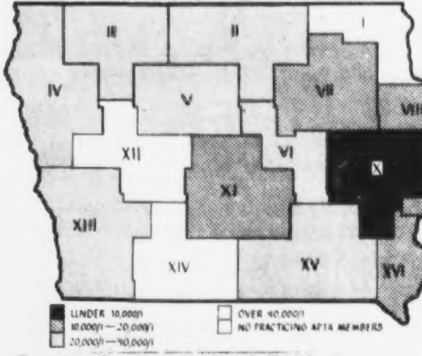
Source: see Appendix J, Table 2

Map 2. Population per Licensed Physical Therapist for Iowa by County: 1970


UNDER 10,000/1
10,000/1—20,000/1
OVER 20,000/1
NO PHYSICAL THERAPISTS

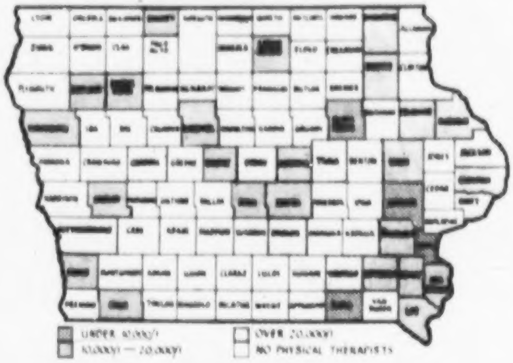
Source: See Appendix J, Table 2

Map 3. Population per Licensed Practicing APTA Physical Therapist for Iowa by Region: 1970


III
II
I
IV
V
VII
VIII
XII
VI
X
IX
XI
XIII
XIV
XV
XVI
UNDER 10,000/1
10,000/1 — 20,000/1
20,000/1 — 40,000/1
OVER 40,000/1
NO PRACTICING APTA MEMBERS

Source: See Appendix J, Table 2.

Map 4. Population per Licensed Practicing APTA Physical Therapist for Iowa by County: 1970


UNDER 10,000/1
10,000/1 — 20,000/1
OVER 20,000/1
NO PHYSICAL THERAPISTS

Source: See Appendix J, Table 2

*Map with county identifications of legible size on Page 91, Appendices Section.

For purpose of judgment, we note that the APTA has designated 10,000 persons per physical therapist as an ideal ratio under today's standards of care. The state ratio of population per physical therapist was 11,913. Map 2 presents the ratios of population per licensed physical therapist on a countywide basis. (See Table 2, Appendix J.)

A large number of the state's licensed physical therapists are voluntarily inactive, retired, or students. Consequently, a more accurate picture of the geographic distribution of physical therapists' services in relation to the population is obtained by examining data on practicing physical therapists. As noted, such data are available only for members of the Iowa Chapter of the APTA. In March 1970 the APTA had 144 physical therapist members practicing in Iowa.

About 57 percent of these had business offices located in Johnson, Polk, Black Hawk, Dubuque or Linn counties. It should be kept in mind, however, that although a therapist's business office may be located in a given county, he may also have patients in hospitals or other health care facilities located in other counties; so a physical therapist may actually work in several different counties.

Regional ratios of population per practicing APTA member are presented in Map 3. There were no practicing APTA members in March 1970 with business offices in Region XIV, and there was only one practicing member-therapist each in Regions XII and I. Eight regions exhibit ratios in the 20,000-40,000 range; four, 10,000-20,000; and only Region X had a population ratio per practicing APTA member under 10,000.

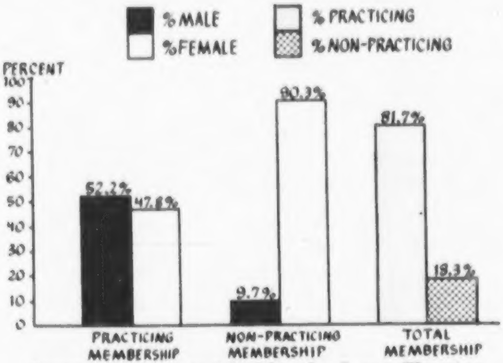
Map 4 shows Iowa counties' ratios of population per practicing APTA member. Practicing APTA members had "business addresses" in only 36 of Iowa's 99 counties, despite the fact that 15 percent of all hospital admissions—on the average—required some physical therapy.[3] Eight county ratios exceeded 20,000, and 24 county ratios were between 10,000 and 20,000.

Only four counties exhibited a population per practicing APTA member ratio of under 10,000. The Iowa ratio of population per practicing APTA member was 19,097, although 64 counties were without a practicing member since APTA members were concentrated mainly in five counties. (See Table 2, Appendix J.)

According to the Iowa Chapter of the APTA, Iowa has a higher proportion of male physical therapists than does the nation as a whole. It is estimated that nationally, only 30-35 percent of the physical therapists are males. The Iowa APTA membership is nearly 47 percent male, which helps provide the state with a fairly stable core of therapists.

Chart 2 presents recent information on the sex distribution among practicing and non-practicing APTA members. Slightly more than 52 percent of all practicing members are male, but only about 10 percent of those *not* practicing are males. In contrast, about one-fifth of Iowa's APTA members were not practicing in the first quarter of 1970, and 90 percent of this group were women.

Chart 2. Distribution of Iowa's Practicing and Non-Practicing APTA Members by Sex: 1970

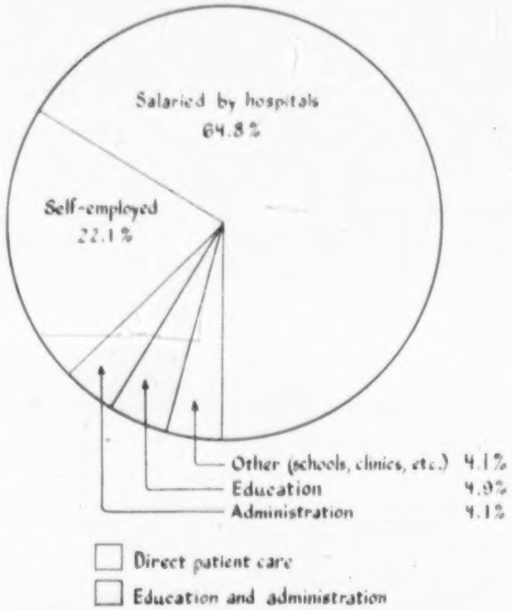


Source: Data provided by the Iowa Chapter, American Physical Therapy Association

At the time of this study, information on the age distribution and educational background of Iowa's physical therapists was not available. However, the Iowa Chapter of the American Physical Therapy Association is currently gathering such data; also information on physical therapy assistants and aides.

A physical therapy assistant is a graduate of a two-year junior college with a curriculum developed along APTA guidelines; he assists the physical therapist in patient-related activities. The licensing of assistants is proposed in some states.

Chart 3. Distribution of Iowa's Practicing APTA Members by Type of Employment Status: 1969



Source: See Appendix J, Table 3.

A physical therapy aide is a non-licensed worker who has completed a training program through on-the-job training or an accredited educational institution. Aides and assistants may provide important future sources of additional physical therapy services.

Chart 3 illustrates the *1969* percentage distribution of practicing Iowa APTA members by type of employment. The unshaded area indicates that only nine percent of the members were employed in fields other than direct patient care. Including a few licensed practicing therapists who were ineligible for APTA membership, over 91 percent of employed therapists in Iowa were then involved in direct patient care.

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[1] When licensing was first established in Iowa, it was possible to obtain a license under a "grandfather clause." However, today licenses may not be issued under this clause.

[2] The Iowa Chapter of the APTA estimates its professional membership constitutes approximately 90 percent of the current physical therapy work force in Iowa.

[3] Estimate provided by Professor Terry Jones, Director, Physical Therapy School, University Hospitals, Iowa City, Iowa.

RADIOLOGIC TECHNOLOGY

Radiologic technologists are health personnel whose function is to assist physicians in the diagnosis and treatment of disease. They operate X-ray and other radiation equipment under the general direction of a physician, who is usually a radiologist.

In the United States, radiologic technologists are licensed only in New Hampshire, New Jersey and New York. However, they may choose to be certified by one or more of the three national professional organizations for radiologic technologists: The American Society of Radiologic Technologists (ASRT), The American Radiographic Technologists (A.R.T.), and The American Registry of Radiologic Technologists (ARRT).

The ARRT is the largest group. It had 48,707 members in the United States in 1967, two-thirds of whom were professionally active. The ASRT listed 14,116 active and associate members and the ART 5,000 active members in 1967.[1]

Table 1 shows the general growth trends in the numbers of radiologic technologists in each of the three specialties within the field. The figures reported for both Iowa and the United States represent members of the ARRT only. Over the time interval considered, the number of X-ray technologists has increased steadily at both the state and national levels. In neither of the other specialized areas have the national growth trends been duplicated in Iowa.

Table 1. Membership of American Registry of Radiologic Technologists [a] for Iowa and the United States for Selected Years

	X-ray Tech's		Nuc. Med. Tech's		Rad. Ther. Tech's	
	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.
1965[b]	728	41,117	1	248	0	89
1967[c]	880	48,707	1	390	0	181
1969[d]	988	57,092	4	698	0	277

[a] Includes both active and inactive members of the ARRT.

[b] National Center for Health Statistics, *Health Resources Statistics, 1965*, (Public Health Service, Washington, D.C.), 1968.

[c] *Health Resources Statistics, 1968.*

[d] *The American Registry of Radiologic Technicians* for September, 1969.

Candidates for registration in X-ray technology must complete a formal program of training approved by the Council on Medical Education of the American Medical Association (CME:AMA)[2] These programs are conducted by hospitals, and by community colleges and medical schools with hospital affiliations. These programs are most usually open to high school graduates, but a few require one or two years of college or graduation from a school of nursing. Requirements of the approved programs vary from a minimum of two years in a hospital radiology department, or a junior college offering an associate degree, to a four-year university course leading to a bachelor's degree.[3]

Table 2. CME:AMA-Approved Educational Programs in X-ray Technology, Students, and Graduates; for Iowa and the United States for Selected Years

	United States			Iowa		
Academic Year	School	Students	Graduates	Schools	Students	Graduates
1949-50[a]	267	1,447	923	n.a.	n.a.	n.a.
1960-61[a]	650	5,049	n.a.	n.a.	n.a.	n.a.
1964-65[a]	789	7,726	3,158	18	159	72
1966-67[b]	967	10,130	3,827	21	208	83

[a] *Health Resources Statistics, 1965.*

[b] *Health Resources Statistics, 1968.*

ARRT registration in either nuclear medicine technology or radiation therapy technology requires professional training beyond the level of X-ray technology. Registration upon successful completion of the requirements of any of the three professional organizations qualifies the technologist to use his specialty title and its abbreviation—"RT"—after his name. This is usually accompanied by the initials of the professional group, i.e., "RT (ARRT)".[4]

Table 2 displays a time series of data for selected years since 1949 on approved educational programs in X-ray technology. Over the 18-year interval the number of schools, students, and graduates has been steadily advancing for both the United States and Iowa.

Of the 967 presently approved schools, more than 90 percent are hospital-based and conduct programs of at least 24-month duration. They provide general training in X-ray technology, and some include a limited program of instruction in radiation therapy and nuclear medicine technology.[5]

Data on the number and characteristics of Iowa's radiologic technicians are not readily available because there is no central source of data in the absence of state licensing. However, the American Registry of Radiologic Technologists and the Iowa Society of Radiologic Technologists (ISRT), which is affiliated with the American Society of Radiologic Technologists, maintain some records on their members. The characteristics of Iowa's radiologic technologists must be examined with that *caveat* in mind.

CHARACTERISTICS OF IOWA'S RADIOLOGIC TECHNOLOGISTS

Age, Training, Employment and Activity Status

Unfortunately, none of the professional societies maintains files on the age, training, education or the type of practice that its members conduct. Minimum educational and training requirements have been reported above. Nothing is known of the education of registered radiologic technologists beyond those minimums.

Concerning employment status, it has been estimated that one-fourth of the radiologic technologists work in hospitals. The remainder are employed in independent X-ray laboratories, in physicians' and dentists' offices, and in government agencies.[6] The degree to which employment is full- or part-time is unknown.

Marital and Sex Status

Data regarding the marital status of radiologic technologists are not available for either Iowa or the United States. Distribution of radiologic technologists by sex, however, was ascertainable by simply counting the number of male and female members listed by the American Registry of Radiologic Technologists and the Iowa Society of Radiologic Technologists. The results are summarized in Table 3.

Table 3. Distribution of Registered Radiologic Technologists by Sex and Professional Society: 1969

	Number	Percent
Female	57	55.4
Male	46	44.7
ISRT total[a]	103	100.0
	Number	**Percent**
Female	808	82.8
Male	180	17.2
ARRT (Iowa) total[b]	988	100.0

[a] Active membership list furnished by Iowa Society of Radiologic Technologists.

[b] *American Registry of Radiologic Technologists* for September, 1969

Table 3 indicates that more women than men are professionally employed as radiologic technologists. Approximately 17.2 percent of radiologic technologists in the ARRT were men, and 82.8 percent were women. The ISRT membership was much more evenly divided between male and female, approximately 55 percent of the active members being women and 45 percent men. The size of the sample provided by the ARRT represents, of course, a more significant proportion of the total number of radiologic technologists in Iowa.

Geographical Distribution

Table 4 presents the ratios of population per X-ray technologist (RT-ARRT) for the United States and Iowa for selected years. Although the number of X-ray technologists in Table 4 does not represent the total number of radiologic technologists qualified to provide service, or in any accurate way indicate a population-per-employed ratio, it does provide an indication of the growth of the profession in relation to population trends for both Iowa and the United States.

The time interval represented by Table 4 is too short to justify any definite statements concerning the relative trends in the United States or Iowa as to population per X-ray technologist. Both the United States and Iowa exhibited ratios which declined at approximately the same rate during the period considered; but the Iowa ratio was smaller in all three years. In 1969 the

Table 4. Population per X-ray Technologist (RT/ARRT) for the United States and Iowa for Selected Years

	Number of X-ray Technologists[a]			Population[e] (x1000)			Population per X-ray Technologist (RT/ARRT)		
	1965[b]	1967[c]	1969[d]	1965	1967	1969	1965	1967	1969
United States	41,117	48,707	57,092	193,815	197,859	201,593	4,714	4,062	3,531
Iowa	728	880	988	2,766	2,772	2,774	3,799	3,150	2,808

[a] Number of "Registered X-ray Technologists": RT (ARRT).

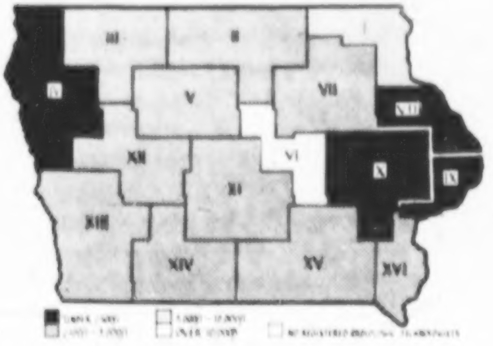
[b] National Center for Health Statistics, *Health Resources Statistics, 1965*, (Public Health Services, Washington, D.C.), 1965.

[c] *Health Resources Statistics, 1968*.

[d] *Amercan Registry of Radiologic Technologists* for September, 1969.

[e] U.S. Bureau of the Census, *Statistical Abstract of the United States: 1969*. (90th Edition) Washington, D. C., 1969.

Map 1. Population per Registered X-ray Technologist (RT/ARRT) for Iowa by Region: 1969



Source: See Appendix K, Table 1.

Iowa population per X-ray technologist (RT-ARRT) was 2,808, down from 3,799 in 1965, while the United States ratio dropped to 3,531 from a 1965 figure of 4,714.

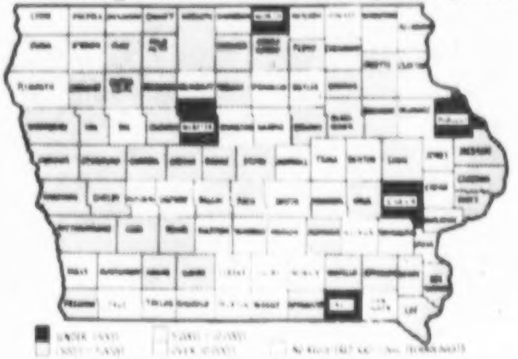
The figures in Table 4 should be applied cautiously because not all radiologic technicians are represented, and also because there is no way of ascertaining the number employed or their productivity. Table 4 cannot be used to compare the services available at the Iowa level with those for the nation as a whole. Table 4 indicates, at most, that Iowa appears to have an advantage in ratio of population per registered radiologic technologist.

The radiologic technologist population of Iowa, as represented by the ARRT members, is by no means uniformly distributed throughout the state. (See Appendix K, Table 1). The number of X-ray technicians presented in Appendix K, Table 1 is a recognized underestimate of the total number of radiologic technologists in Iowa. And it is not intended to reflect actual population-employed ratios. This table only gives an indication of the geographical distribution of radiologic technologists throughout Iowa.

The state ratio of population per X-ray technologist (RT-ARRT) for 1969 was by best estimate 2,785. This figure differs from that in Table 4, which employed U.S. Bureau of the Census population estimates instead of the Iowa State Department of Health estimates used here. Table 1 shows the county ratios to range from a high of 21,710 in Warren to a low of 835 persons-per-RT in Johnson County.

Maps 1 and 2 depict the Appendix K, Table 1 data by region and county, respectively. Map 1 shows a preponderance of X-ray technologists in east central Iowa, where three of the four regions with ratios of 2,500 or less are situated.

Map 2. Population per Registered X-ray Technologist (RT/ARRT) for Iowa by County: 1969



Source: See Appendix K, Table 1.
*Map with county identifications of legible size on Page 91, Appendices Section.

Ten regions have population per X-ray technologist (RT-ARRT) ratios of 2,500 to 5,000. The latter are in reasonable line with the state ratio of 2,785 persons. Only Region VI had a ratio in excess of 10,000.

Map 2 shows distribution in more detail, by counties. Nine counties, mostly in Iowa's southern tier, reported no X-ray technologists (RT-ARRT). Five counties possessed ratios of 1,500 persons or less. Forty-seven counties are in the median range of 1,500 to 5,000 persons, while the ratios of 24 were between 5,000 and 10,000. Fourteen counties had ratios greater than 10,000 persons per X-ray technologist (RT-ARRT).

SUMMARY

Radiologic technology is a licensed profession in only three states so data must be collected from the three professional registration organizations. Gauged by the membership statistics of the largest of these, the American Registry of Radiologic Technologists, the profession is clearly growing both in Iowa and the United States—not only in absolute numbers, but in relation to the population as well. Iowa, with its 1969 ratio of population per X-ray technologist (RT-ARRT) of 2,785, compares favorably with the United States.

Registered radiologic technicians, who typically undergo a training period of at least two years, are employed primarily in physicians' and dentists' offices and in independent X-ray laboratories. Data on age, education, employment and activity status, and length of training are unavailable for radiologic technologists in Iowa. From membership lists of the ISRT and the ARRT it is known that women technologists outnumber member by about four to one.

Registered X-ray technologists (RT-ARRT) are not uniformly distributed throughout Iowa. The easternmost regions of the state have the most favorable ratios of population per X-ray technologist (RT-ARRT) when compared to the state ratio of 2,785. Nine Iowa counties have no X-ray technologist registered with the ARRT.

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[1] National Center for Health Statistics, *Health Resources Statistics, 1968* (Public Health Service, Washington, D.C.), 1968.

[2] *Ibid*

[3] *Ibid*

[4] *Ibid* and *The American Registry of Radiologic Technologists* for September, 1969.

[5] *Health Resources Statistics, 1968*

[6] *Ibid*

SPEECH PATHOLOGY AND AUDIOLOGY

Speech pathologists and audiologists are health personnel whose primary concern is the discovery and treatment of disorders in the production, reception and perception of speech and language. They help to identify persons who have such disorders and to determine the causes, history and severity of specific disorders. They also provide remediation or conservational programs to speech-handicapped and hearing-handicapped individuals.

Speech and hearing clinicians are grouped together in this study for two reasons. First, several persons are professionally qualified to work in both fields; second, data are available on speech and hearing personnel from their single professional organization, the American Speech and Hearing Association (ASHA).

ASHA has experienced a rapid growth in membership in recent years, from 1,800 in 1950 to over 12,000 in 1967. About 2,000 ASHA members in 1967, however, were students and were not employed.[1]

Speech and hearing clinicians are not licensed in Iowa. However, two "Certificates of Clinical Competence" are awarded by ASHA, one in speech pathology and one in audiology. Applicants for certification must hold a master's degree from a training program which includes substantial practical experience. Applicants also must be ASHA members with one year of professional experience after graduation, supervised by an ASHA-certified clinician.

Certification is granted after the applicant passes a national examination. At the close of 1967, 4,343 persons held Certificates of Clinical Competence in speech pathology and 853 in audiology.

Speech and hearing professionals in Iowa are a notably mobile group with respect to movements into and out of the state. It is consequently difficult at any one point in time to number and locate all speech and hearing personnel in Iowa.

Many clinicians do not belong to ASHA; and many ASHA members do not belong to the statewide professional organization, the Iowa Speech and Hearing Association.

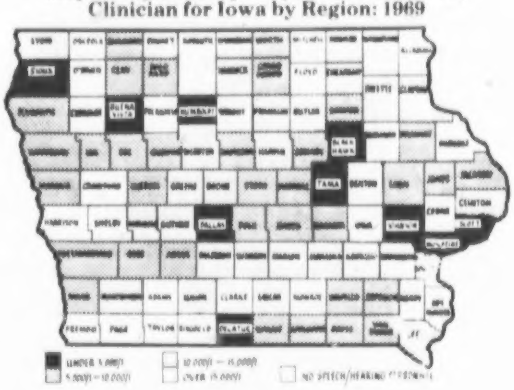
For example, 75 new speech clinicians were employed in the fall of 1968 in public schools in Iowa; 22 clinicians had master's degrees, and 53 had B.A. degrees thus being ineligible for ASHA membership and certification).

Speech and hearing personnel are employed by institutions and agencies such as public school systems, private schools, hospitals, rehabilitation centers, medical clinics, colleges and universities, and nursing homes. In addition, some clinicians have private practices.

Of the 8,236 professionally active ASHA members responding to a 1966 national survey, 22.2 percent were employed by a college or university, 51.0 percent were employed in elementary or secondary schools, and 16.7 percent were employed at a speech and hearing center not connected with a college or university.[2]

Map 1 illustrates population-per-clinician ratios for the 99 Iowa counties. These ratios were computed using May 1969 data on the geographical distribution of speech and hearing personnel in Iowa, independent of their professional affiliation. At that time, public school speech and hearing clinicians constituted over half the total number of personnel reported in Iowa.

Map 2. Population per Speech and Hearing Clinician for Iowa by Region: 1969



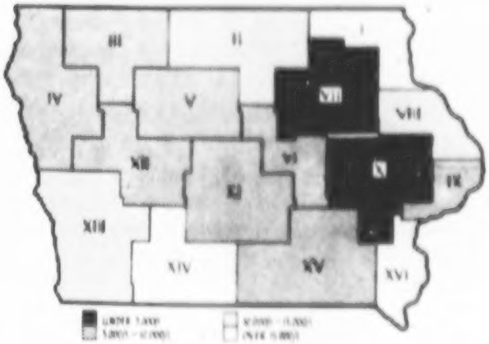
Source: See Appendix L, Table 1.

***Map with county identifications of legible size on Page 91, Appendices Section.**

Ten counties exhibit a population-per-clinician ratio under 5,000; 34 counties, ratios between 5,000, and 10,000; 24 counties have ratios between 10,000 and 15,000; 17 counties have ratios exceeding 15,000. There are 14 counties for which no speech and hearing personnel were reported.

Map 2 illustrates population-per clinician ratios for the 16 multi-county regions of Iowa. One-half of the regions have ratios in the 5,000-10,000 range. Only two regions have a ratio under 5,000; and six regions have ratios exceeding 10,000. The state ratio was 6,949.

Map 1. Population per Speech and Hearing Clinician for Iowa by County: 1969



Source: See Appendix L, Table 1.

At this time, there is no information available regarding the age distribution and sex distribution of speech and hearing personnel in Iowa. But if recent trends are indicative, the growing annual number of individuals completing educational programs in this professional area would suggest a relatively young average age.

The Department of Health, Education and Welfare reported 3,688 graduates of B.A., M.A., and Ph.D. programs in speech pathology and audiology in the 1964-65 school year, 4,716 graduates in 1965-66, and an estimated 5,864 graduates in 1966-67.[2] The number of enrollments in each of the three degree programs has been increasing over this period, also.[3]

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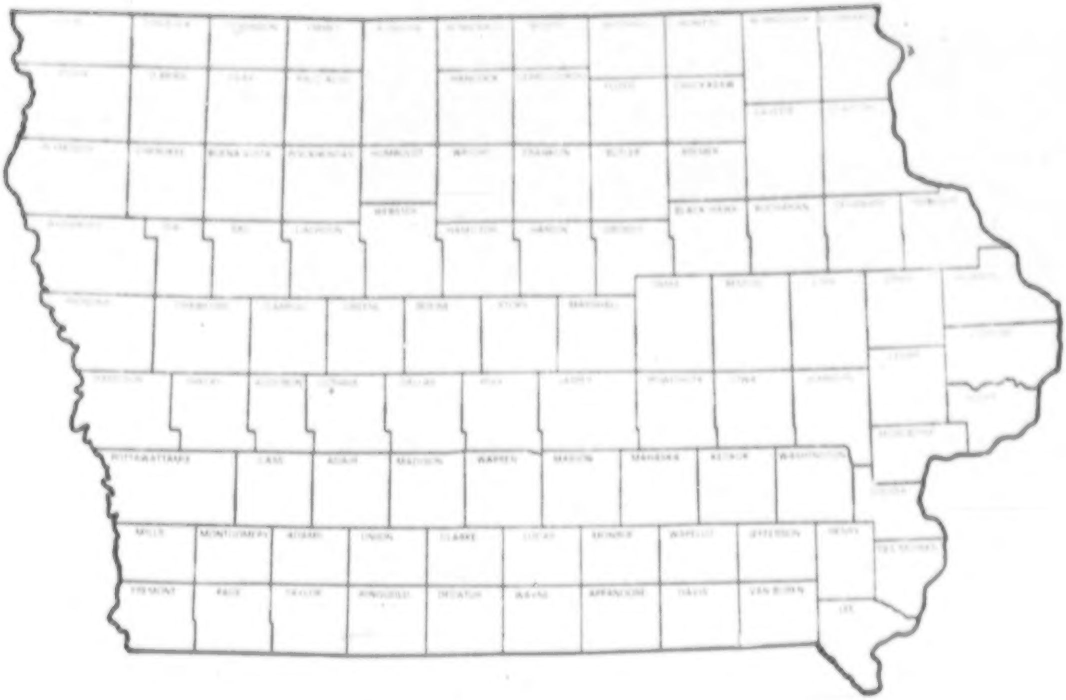
[1] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D. C.

[2] *Ibid.*

[3] *Ibid.*

APPENDICES



[a] Reproduced for convenience in identification of individual counties.

APPENDIX A

Table 1.—Part I Non-Federal Medical Physicians (MD) and Practice Data by County and Region: Iowa, 1967[a]

		Patient Care						
			Solo, Partnership, Group and Other Practice					
				Specialties				
County	Total Non-Federal	Total Patient Care	General Practice	Medical	Surgical	Other	Hospital Based	Other Prof. Activities and Inactive[b]
Adair	2	2	2	0	0	0	0	0
Adams	3	3	3	0	0	0	0	0
Allamakee	11	10	9	1	0	0	0	1
Appanoose	12	12	11	0	0	0	1	0
Audubon	3	3	3	0	0	0	0	0
Benton	11	10	10	0	0	0	0	1
Black Hawk	127	121	39	12	41	25	4	6
Boone	18	17	11	0	2	4	0	1
Bremer	15	15	10	2	3	0	0	0
Buchanan	32	31	6	0	0	2	23	1
Buena Vista	12	11	10	0	1	0	0	1
Butler	7	7	7	0	0	0	0	0
Calhoun	13	13	11	0	2	0	0	0
Carroll	21	20	9	2	7	2	0	1
Cass	11	11	8	0	2	0	1	0
Cedar	9	9	9	0	0	0	0	0

Table 1.—Part I Continued

Table 1.—Part I Non-Federal Medical Physicians (MD) and Practice Data by County and Region: Iowa, 1967[a]

County	Total Non-Federal	Patient Care						Other Prof. Activities and Inactive[b]
		Total Patient Care	Solo, Partnership, Group and Other Practice				Hospital Based	
			General Practice	Specialties				
				Medical	Surgical	Other		
Cerro Gordo	70	68	20	15	22	9	2	2
Cherokee	33	31	7	1	2	3	18	2
Chickasaw	9	9	6	0	3	0	0	0
Clarke	5	5	5	0	0	0	0	0
Clay	13	12	11	0	0	1	0	1
Clayton	11	11	10	0	1	0	0	0
Clinton	48	44	19	6	13	6	0	4
Crawford	9	9	8	0	1	0	0	0
Dallas	21	19	13	0	1	0	5	2
Davis	12	12	1	5	5	1	0	0
Decatur	6	5	4	1	0	0	0	1
Delaware	7	5	5	0	0	0	0	2
Des Moines	53	49	8	6	20	15	0	4
Dickinson	9	8	4	1	2	1	0	1
Dubuque	69	63	9	15	28	11	0	6
Emmet	12	10	7	0	1	2	0	2
Fayette	20	20	18	0	2	0	0	0
Floyd	17	17	12	0	3	1	1	0
Franklin	7	7	5	1	1	0	0	0
Fremont	5	5	5	0	0	0	0	0
Greene	11	9	7	0	2	0	0	2
Grundy	7	7	7	0	0	0	0	0
Guthrie	7	7	7	0	0	0	0	0
Hamilton	11	11	9	1	1	0	0	0
Hancock	6	6	6	0	0	0	0	0
Hardin	15	15	13	0	2	0	0	0
Harrison	10	9	9	0	0	0	0	1
Henry	23	21	9	1	0	3	8	2
Howard	7	7	7	0	0	0	0	0
Humboldt	7	7	7	0	0	0	0	0
Ida	5	4	4	0	0	0	0	1
Iowa	14	14	13	0	0	0	1	0
Jackson	12	12	12	0	0	0	0	0
Jasper	22	21	15	0	3	2	1	1
Jefferson	12	11	10	0	1	0	0	1
Johnson	555	381	20	8	19	9	325	174
Jones	16	13	11	0	1	0	1	3
Keokuk	5	5	5	0	0	0	0	0
Kossuth	10	10	10	0	0	0	0	0
Lee	42	39	20	3	11	4	1	3
Linn	163	151	58	18	37	27	11	12
Louisa	3	3	3	0	0	0	0	0
Lucas	3	3	3	0	0	0	0	0
Lyon	5	5	5	0	0	0	0	0
Madison	4	4	4	0	0	0	0	0
Mahaska	19	16	9	0	3	0	0	1
Marion	16	15	12	0	3	0	0	1
Marshall	40	38	14	3	15	5	1	2
Mills	11	9	5	0	0	0	4	2
Mitchell	13	11	9	0	2	0	0	2
Monona	9	9	9	0	0	0	0	0
Monroe	3	3	3	0	0	0	0	0
Montgomery	10	9	7	0	2	0	0	1
Muscatine	23	20	13	1	4	1	1	3
O'Brien	10	10	10	0	0	0	0	0
Osceola	3	3	3	0	0	0	0	0
Page	24	20	8	1	4	1	6	4
Palo Alto	11	11	9	1	1	0	0	0
Plymouth	12	10	9	0	1	0	0	2
Pocahontas	7	7	6	0	1	0	0	0
Polk	366	337	65	53	87	75	57	29
Pottawattamie	70	68	17	17	24	10	0	2
Poweshiek	10	9	8	0	1	0	0	1
Ringgold	1	1	1	0	0	0	0	0
Sac	8	8	8	0	0	0	0	0

Continued

Table 1. – Part I Non-Federal Medical Physicians (MD) and Practice Data by County and Region: Iowa: 1967[a]

County	Total Non-Federal	Patient Care						Other Prof. Activities and Inactive[b]
		Total Patient Care	Solo, Partnership, Group and Other Practice				Hospital Based	
			General Practice	Specialties				
				Medical	Surgical	Other		
Scott	119	115	35	21	35	21	3	4
Shelby	7	7	6	1	0	0	0	0
Sioux	11	10	8	1	1	0	0	1
Story	59	52	14	12	12	7	7	7
Tama	7	7	7	0	0	0	0	0
Taylor	2	2	2	0	0	0	0	0
Union	12	11	5	1	4	1	0	1
Van Buren	3	3	3	0	0	0	0	0
Wapello	46	44	17	6	11	9	1	2
Warren	7	5	4	0	0	1	0	2
Washington	13	11	11	0	0	0	0	2
Wayne	4	3	3	0	0	0	0	1
Webster	58	54	19	9	14	11	1	4
Winnebago	7	7	7	0	0	0	0	0
Winneshiek	11	11	9	0	1	1	0	0
Woodbury	122	114	40	[illegible]	42	9	1	8
Worth	4	4	4	[illegible]	0	0	0	0
Wright	13	13	12	[illegible]	1	0	0	0
Region I	40	39	35	1	2	1	0	1
Region II	132	128	69	16	26	10	7	4
Region III	70	65	54	2	6	3	0	5
Region IV	197	183	82	22	46	12	21	14
Region V	109	105	64	10	19	11	1	4
Region VI	72	69	42	3	18	5	1	3
Region VII	217	210	83	14	49	27	27	7
Region VIII	88	80	26	15	28	11	0	8
Region IX	190	179	67	28	52	28	4	11
Region X	781	589	132	26	57	36	338	192
Region XI	515	472	138	65	108	89	70	43
Region XII	59	56	42	2	10	2	0	3
Region XIII	148	138	55	19	32	11	11	10
Region XIV	31	29	22	2	4	1	0	2
Region XV	119	112	65	13	21	10	3	7
Region XVI	121	112	40	10	31	22	9	9
State	2889	2566	1040	248	510	280	488	323

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Table 1. – Part II

County	County Group[c]	Total Population	Population-Patient Care Physician Ratio	Number of Hospitals	Number of Hospital Beds	Per Capita Personal Income
Adair	2	9,330	4,665	0	0	$1,736
Adams	1	6,360	2,120	1	32	1,652
Allamakee	2	15,960	1,596	2	72	1,439
Appanoose	2	15,270	1,273	1	74	1,850
Audubon	2	10,020	3,340	1	30	1,795
Benton	2	22,150	2,215	1	36	1,979
Black Hawk	6	125,360	1,036	4	659	2,566
Boone	3	25,620	1,507	1	100	2,210
Bremer	2	20,940	1,396	2	81	2,171
Buchanan	2	20,450	660	1	56	1,797
Buena Vista	2	20,640	1,876	2	106	2,084
Butler	2	16,290	2,327	0	0	1,818
Calhoun	2	15,880	1,222	1	42	1,957
Carroll	2	24,300	1,215	1	110	1,922
Cass	2	18,080	1,644	1	66	2,155
Cedar	2	18,050	2,006	0	0	$1,806
Cerro Gordo	4	48,570	714	2	367	2,401
Cherokee	2	17,690	551	1	125	1,802
Chickasaw	2	14,450	1,606	1	44	1,775
Clarke	1	7,620	1,524	1	32	1,963
Clay	2	17,990	1,499	1	90	2,138

Continued

County	County Group[c]	Total Population	Population-Patient Care Physician Ratio	Number of Hospitals	Number of Hospital Beds	Per Capita Personal Income
Clayton	2	21,490	1,954	2	68	1,579
Clinton	4	56,270	1,279	3	246	2,238
Crawford	2	19,540	2,171	1	50	1,848
Dallas	2	23,360	1,229	1	21	2,192
Davis	1	8,780	732	1	76	1,682
Decatur	2	7,380	1,476	1	32	1,628
Delaware	2	17,030	3,406	1	68	1,507
Des Moines	3	47,720	974	2	337	2,594
Dickinson	2	12,820	1,603	1	50	1,919
Dubuque	6	88,120	1,399	3	558	2,234
Emmet	2	14,280	1,428	1	117	1,994
Fayette	3	29,120	1,456	2	91	1,877
Floyd	2	20,860	1,227	1	72	2,228
Franklin	2	13,730	1,961	1	48	2,019
Fremont	1	9,880	1,976	1	29	1,870
Greene	2	13,290	1,477	1	125	1,918
Grundy	2	14,030	2,004	1	40	1,826
Guthrie	2	12,990	1,856	1	42	1,714
Hamilton	2	19,950	1,814	1	76	2,081
Hancock	2	13,910	2,318	1	32	1,676
Hardin	2	12,660	844	2	75	2,121
Harrison	2	16,840	1,871	1	46	1,834
Henry	2	17,590	838	1	53	2,203
Howard	2	12,440	1,777	1	42	1,552
Humboldt	2	12,990	1,856	0	0	2,116
Ida	1	9,410	2,353	1	42	1,815
Iowa	2	16,590	1,185	1	36	1,849
Jackson	2	20,890	1,741	2	88	1,946
Jasper	3	34,730	1,654	1	125	2,406
Jefferson	2	14,890	1,354	1	78	2,064
Johnson	4	59,310	156	2	1,432	2,540
Jones	2	20,060	1,543	2	98	2,010
Keokuk	2	15,250	3,050	0	0	1,766
Kossuth	2	24,550	2,455	1	40	1,640
Lee	3	44,860	1,150	3	323	2,375
Linn	6	145,720	965	2	715	2,789
Louisa	2	10,680	2,560	0	0	1,899
Lucas	2	10,130	3,377	0	0	1,977
Lyon	2	14,020	2,804	1	30	1,563
Madison	2	11,970	2,993	1	38	1,821
Mahaska	2	21,600	1,350	1	77	2,057
Marion	3	26,170	1,745	2	88	2,033
Marshall	3	37,650	991	2	240	2,421
Mills	2	11,370	1,263	0	0	1,886
Mitchell	2	13,680	1,244	1	64	1,816
Monona	2	13,040	1,449	1	40	1,795
Monroe	1	9,410	3,137	1	55	1,641
Montgomery	2	13,070	1,452	1	44	2,107
Muscatine	3	34,680	1,734	1	120	2,308
O'Brien	2	18,990	1,899	2	113	1,816
Osceola	1	8,970	2,990	1	38	1,718
Page	2	19,040	952	2	115	2,214
Palo Alto	2	14,280	1,298	1	62	1,493
Plymouth	3	24,220	2,422	2	65	1,762
Pocahontas	2	13,480	1,926	0	0	1,788
Polk	6	272,810	810	6	1,505	2,882
Pottawattamie	7	84,510	1,243	2	534	2,225
Poweshiek	2	18,140	2,016	2	82	2,006
Ringgold	1	7,150	7,150	0	0	1,472
Sac	2	16,240	2,030	1	32	1,892
Scott	6	126,010	1,096	2	547	2,689
Shelby	2	15,800	2,257	1	48	1,688
Sioux	3	26,420	2,642	3	152	1,591
Story	4	54,580	1,050	3	248	2,603
Tama	2	20,390	2,913	0	0	1,764
Taylor	1	9,470	4,735	0	0	1,562
Union	2	13,290	1,208	0	0	1,936
Van Buren	1	9,380	3,127	0	0	1,643
Wapello	3	44,610	1,014	2	368	$2,370
Warren	2	21,710	4,342	0	0	2,036
Washington	2	18,990	1,726	1	45	1,983
Wayne	1	8,720	2,907	0	0	1 843
Webster	3	47,860	886	2	410	2,437
Winnebago	2	12,690	1,813	2	39	2,092

Continued

County	County Group[c]	Total Population	Population-Patient Care Physician Ratio	Number of Hospitals	Number of Hospital Beds	Per Capita Personal Income
Winneshiek	2	19,650	1,786	1	46	1,709
Woodbury	6	105,650	927	3	890	2,467
Worth	1	8,970	2,243	0	0	1,850
Wright	2	18,800	1,446	2	74	2,088
Region I		69,540	1,783	6	228	
Region II		156,960	1,226	9	662	
Region III		107,970	1,661	9	576	
Region IV		210,450	1,150	12	1,344	
Region V		128,960	1,228	6	602	
Region VI		97,840	1,418	6	397	
Region VII		240,640	1,146	11	971	
Region VIII		126,040	1,576	6	714	
Region IX		216,960	1,212	6	931	
Region X		301,230	527	9	2,362	
Region XI		470,950	1,002	15	2,125	
Region XII		96,380	1,721	6	389	
Region XIII		188,590	1,367	9	882	
Region XIV		60,600	2,090	3	96	
Region XV		158,040	1,411	7	728	
Region XVI		120,850	1,079	6	713	
State		2,752,000	1,072	126	13,702	

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[a] All data with the exception of the population estimates comes from the book *Distribution of Physicians, Hospitals and Hospital Beds in the U.S., 1967*. Department of Survey Research, American Medical Association, Chicago, 1968.

[b] Includes medical school faculty, administration, and research.

[c] Demographic county classification developed by the A.M.A. Department of Survey Research.

County Classification	Definition
1	Non-Metropolitan counties with under 10,000 inhabitants.
2	Non-Metropolitan counties with 10,000-25,000 inhabitants.
3	Non-Metropolitan counties with 25,000-50,000 inhabitants.
4	Non-Metropolitan counties with over 50,000 inhabitants.
5	Counties considered potential SMSA's.
6	Counties in SMSA's with 50,000-500,000 inhabitants.
7	Counties in SMSA's with 500,000-1,000,000 inhabitants.
8	Counties in SMSA's with 1,000,000-5,000,000 inhabitants.
9	Counties in SMSA's with 5,000,000 or more inhabitants.

Table 2. Doctors of Osteopathy by County, Region and State: Iowa, 1967[a]

		Patient Care								
			Solo, Partnership, Group or Other Practice							
				Specialties						
	Total D.O.	Total Patient Care	General Practice	Medical	Surgical	Other	Hospital Based	Other Activity[b]	In-active and No Information
Adair	3	3	3	0	0	0	0	0	0
Adams	1	0	0	0	0	0	0	0	1
Allamakee	0	0	0	0	0	0	0	0	0
Appanoose	1	1	1	0	0	0	0	0	0
Audubon	1	1	1	0	0	0	0	0	0
Benton	1	1	1	0	0	0	0	0	0
Black Hawk	3	2	0	0	0	2	0	0	1
Boone	5	5	3	0	1	1	0	0	0
Bremer	1	1	1	0	0	0	0	0	0
Buchanan	2	2	2	0	0	0	0	0	0
Buena Vista	3	1	1	0	0	0	0	0	2
Butler	0	0	0	0	0	0	0	0	0
Calhoun	1	1	1	0	0	0	0	0	0
Carroll	3	3	2	0	0	1	0	0	0
Cass	4	4	3	0	0	1	0	0	0
Cedar	1	1	1	0	0	0	0	0	0
Cerro Gordo	9	8	7	0	0	1	0	0	1
Cherokee	4	3	1	0	0	2	0	0	1
Chickasaw	1	0	0	0	0	0	0	0	1
Clarke	1	1	0	0	0	1	0	0	0
Clay	1	1	0	0	0	1	0	0	0
Clayton	0	0	0	0	0	0	0	0	0
Clinton	3	3	1	0	0	2	0	0	0

Table 2. Doctors of Osteopathy by County, Region and State: Iowa, 1967[a]

	Total D.O.	Patient Care						Other Activity[b]	Inactive and No Information
		Total Patient Care	Solo, Partnership, Group or Other Practice				Hospital Based		
			General Practice	Specialties					
				Medical	Surgical	Other			
Crawford	1	1	0	0	0	1	0	0	0
Dallas	11	11	9	0	0	1	1	0	0
Davis	1	1	1	0	0	0	0	0	0
Decatur	0	0	0	0	0	0	0	0	0
Delaware	2	2	2	0	0	0	0	0	0
Des Moines	4	4	1	0	1	2	0	0	0
Dickinson	3	3	3	0	0	0	0	0	0
Dubuque	4	4	3	0	0	1	0	0	0
Emmet	1	1	0	0	0	1	0	0	0
Fayette	1	1	1	0	0	0	0	0	0
Floyd	0	0	0	0	0	0	0	0	0
Franklin	1	1	1	0	0	0	0	0	0
Fremont	2	1	1	0	0	0	0	0	0
Greene	1	1	1	0	0	0	0	0	1
Grundy	0	0	0	0	0	0	0	0	0
Guthrie	4	4	4	0	0	0	0	0	0
Hamilton	6	6	6	0	0	0	0	0	0
Hancock	3	2	2	0	0	0	0	0	1
Hardin	3	3	3	0	0	0	0	0	0
Harrison	4	4	4	0	0	0	0	0	0
Henry	3	2	2	0	0	0	0	0	0
Howard	0	0	0	0	0	0	0	0	1
Humboldt	2	2	2	0	0	0	0	0	0
Ida	0	0	0	0	0	0	0	0	0
Iowa	0	0	0	0	0	0	0	0	0
Jackson	1	1	1	0	0	0	0	0	0
Jasper	5	5	4	0	1	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0	0
Johnson	0	0	0	0	0	0	0	0	0
Jones	1	1	1	0	0	0	0	0	0
Keokuk	1	1	1	0	0	0	0	0	0
Kossuth	4	4	4	0	0	0	0	0	0
Lee	2	2	2	0	0	0	0	0	0
Linn	8	8	7	0	0	1	0	0	0
Louisa	3	3	2	0	0	1	0	0	0
Lucas	3	3	3	0	0	0	0	0	0
Lyon	2	1	1	0	0	0	0	0	0
Madison	5	5	5	0	0	0	0	0	1
Mahaska	2	2	2	0	0	0	0	0	0
Marion	4	3	3	0	0	0	0	0	0
Marshall	4	4	3	0	0	1	0	0	1
Mills	1	1	1	0	0	0	0	0	0
Mitchell	1	1	1	0	0	0	0	0	0
Monona	1	0	0	0	0	0	0	0	0
Monroe	2	2	2	0	0	0	0	0	1
Montgomery	1	1	1	0	0	0	0	0	0
Muscatine	4	4	3	0	0	1	0	0	0
O'Brien	3	2	2	0	0	0	0	0	1
Osceola	1	1	1	0	0	0	0	0	0
Page	1	1	1	0	0	0	0	0	0
Palo Alto	1	1	1	0	0	0	0	0	0
Plymouth	1	1	0	0	0	1	0	0	0
Pocahontas	1	1	1	0	0	0	0	0	0
Polk	115	90	48	7	9	14	12	16	9
Pottawattamie	3	3	2	0	0	1	0	0	0
Poweshiek	2	2	1	0	1	0	0	0	0
Ringgold	1	1	1	0	0	0	0	0	0
Sac	3	3	3	0	0	0	0	0	0
Scott	35	28	17	2	5	4	4	0	7
Shelby	1	1	1	0	0	0	0	0	0
Sioux	0	0	0	0	0	0	0	0	0
Story	12	11	10	0	1	0	0	0	1
Tama	2	2	2	0	0	0	0	0	0
Taylor	6	5	4	0	0	1	0	0	1
Union	5	5	3	0	0	2	0	0	0
Van Buren	5	4	4	0	0	0	0	0	1
Wapello	7	6	4	0	0	2	0	0	1
Warren	6	5	4	0	0	1	0	0	1

Continued

Table 2. Doctors of Osteopathy by County, Region and State: Iowa, 1967[a]

	Total D.O.	Patient Care: Total Patient Care	Solo, Partnership, Group or Other Practice: General Practice	Specialties: Medical	Specialties: Surgical	Specialties: Other	Hospital Based	Other Activity[b]	Inactive and No Information
Washington	1	1	0	0	0	1	0	0	0
Wayne	3	2	1	0	1	0	0	0	1
Webster	4	4	2	0	1	1	0	0	0
Winnebago	0	0	0	0	0	0	0	0	0
Winneshiek	1	1	1	0	0	0	0	0	0
Woodbury	10	10	9	0	1	0	0	0	0
Worth	1	1	1	0	0	0	0	0	0
Wright	1	1	1	0	0	0	0	0	0
Region 1	1	1	1	0	0	0	0	0	0
Region 2	19	17	16	0	0	1	0	0	2
Region 3	13	10	8	0	0	2	0	0	3
Region 4	18	15	11	0	1	3	0	0	3
Region 5	15	15	13	0	1	1	0	0	0
Region 6	11	11	9	0	1	1	0	0	0
Region 7	8	6	4	0	0	2	0	0	2
Region 8	7	7	6	0	0	1	0	0	0
Region 9	45	38	21	2	5	6	4	0	7
Region 10	12	12	10	0	0	2	0	0	0
Region 11	163	135	86	7	12	17	13	16	12
Region 12	13	13	11	0	0	2	0	0	0
Region 13	17	16	14	0	0	2	0	0	1
Region 14	17	15	11	0	0	4	0	0	2
Region 15	26	23	19	0	1	3	0	0	3
Region 16	12	11	7	0	1	3	0	0	1
State	397	345	248	9	22	50	17	16	36

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[a] American Osteopathic Association Yearbook and Directory of Osteopathic Physicians, 1968. American Osteopathic Association, Chicago, Illinois.

[b] Includes medical school faculty, administration, and research.

Table 3. Non-Federal Physicians (M.D. & D.O.) by County, State, and Region: Iowa 1967[a]

County	Total Physicians (MD & DO)	Patient Care: Total Patient Care	Solo, Partnership, Group or Other Practice: General Practice	Specialties: Medical	Specialties: Surgical	Specialties: Other	Hospital Based	Other Activity	Inactive & No Information	Population-Patient Care Physician Ratio
Adair	5	5	5	0	0	0	0	0	0	1,866
Adams	4	3	3	0	0	0	0	0	1	2,120
Allamakee	11	10	9	1	0	0	0	0	1	1,596
Appanoose	13	13	12	0	0	0	1	0	0	1,175
Audubon	4	4	4	0	0	0	0	0	0	2,505
Benton	12	11	11	0	0	0	0	0	1	2,014
Black Hawk	130	123	39	12	41	27	4	2	5	1,019
Boone	23	22	14	0	3	5	0	0	1	1,165
Bremer	16	16	11	2	3	0	0	0	0	1,309
Buchanan	34	33	8	0	0	2	23	1	0	620
Buena Vista	15	12	11	0	1	0	0	0	3	1,720
Butler	7	7	7	0	0	0	0	0	0	2,327
Calhoun	14	14	12	0	2	0	0	0	0	1,134
Carroll	24	23	11	2	7	3	0	0	1	1,057
Cass	15	15	11	0	2	2	0	0	0	1,205
Cedar	10	10	10	0	0	0	0	0	0	1,805
Cerro Gordo	79	76	27	15	22	10	2	0	3	639
Cherokee	37	34	8	1	2	5	18	2	1	520
Chickasaw	10	9	6	0	3	0	0	0	1	1,606
Clarke	6	6	5	0	0	1	0	0	0	1,270
Clay	14	13	11	0	0	2	0	0	1	1,384
Clayton	11	11	10	0	1	0	0	0	0	1,954
Clinton	51	47	20	6	13	8	0	1	3	1,197
Crawford	10	10	8	0	1	1	0	0	0	1,954
Dallas	32	30	22	0	1	1	6	1	1	806
Davis	13	13	2	5	5	1	0	0	0	675

Table 3. Non-Federal Physicians (M.D. & D.O.) by County, State, and Region: Iowa 1967[a]

County	Total Physicians (MD & DO)	Patient Care							Inactive & No Information	Population-Patient Care Physician Ratio
		Total Patient Care	Solo, Partnership, Group or Other Practice				Hospital Based	Other Activity		
			General Practice	Specialties						
				Medical	Surgical	Other				
Decatur	6	5	4	1	0	0	0	0	1	1,476
Delaware	9	7	7	0	0	0	0	0	2	2,433
Des Moines	57	53	9	6	21	17	0	1	3	900
Dickinson	12	11	7	1	2	1	0	0	1	1,165
Dubuque	73	67	12	15	28	12	0	1	5	1,315
Emmet	13	11	7	0	1	3	0	1	1	1,298
Fayette	21	21	19	0	2	0	0	0	0	1,387
Floyd	17	17	12	0	3	1	1	0	0	1,227
Franklin	8	8	6	1	1	0	0	0	0	1,716
Fremont	7	6	6	0	0	0	0	0	1	1,647
Greene	12	10	8	0	2	0	0	0	2	1,329
Grundy	7	7	7	0	0	0	0	0	0	2,004
Guthrie	11	11	11	0	0	0	0	0	0	1,181
Hamilton	17	17	15	1	1	0	0	0	0	1,173
Hancock	9	8	8	0	0	0	0	0	1	1,739
Hardin	18	18	16	0	2	0	0	0	0	703
Harrison	14	13	13	0	0	0	0	0	1	1,295
Henry	26	23	11	1	0	3	8	1	2	756
Howard	7	7	7	0	0	0	0	0	0	1,777
Humboldt	9	9	9	0	0	0	0	0	0	1,443
Ida	5	4	4	0	0	0	0	1	0	2,353
Iowa	14	14	13	0	0	0	1	0	0	1,185
Jackson	13	13	13	0	0	0	0	0	0	1,607
Jasper	27	26	19	0	4	2	1	0	1	1,336
Jefferson	12	11	10	0	1	0	0	0	1	1,354
Johnson	555	381	20	8	19	9	325	164	10	156
Jones	17	14	12	0	1	0	1	2	1	1,433
Keokuk	6	6	6	0	0	0	0	0	0	2,542
Kossuth	14	14	14	0	0	0	0	0	0	1,753
Lee	44	41	22	3	11	4	1	1	2	765
Linn	171	159	65	18	37	28	11	2	10	916
Louisa	6	6	5	0	0	1	0	0	0	1,780
Lucas	6	6	6	0	0	0	0	0	0	1,688
Lyon	7	6	6	0	0	0	0	0	1	2,337
Madison	9	9	9	0	0	0	0	0	0	1,330
Mahaska	21	18	11	2	4	1	0	0	3	1,200
Marion	20	18	15	0	3	0	0	0	2	1,454
Marshall	44	42	17	3	15	6	1	0	2	991
Mills	12	10	6	0	0	0	4	2	0	1,137
Mitchell	14	12	10	0	2	0	0	0	2	1,140
Monona	10	9	9	0	0	0	0	0	1	1,449
Monroe	5	5	5	0	0	0	0	0	0	1,882
Montgomery	11	10	8	0	2	0	0	0	1	1,307
Muscatine	27	24	16	1	4	2	1	0	3	1,445
O'Brien	13	12	12	0	0	0	0	0	1	1,582
Osceola	4	4	4	0	0	0	0	0	0	2,242
Page	25	21	9	1	4	1	6	2	2	907
Palo Alto	12	12	10	1	1	0	0	0	0	1,098
Plymouth	13	11	9	0	1	1	0	2	0	2,202
Pocahontas	8	8	7	0	1	0	0	0	0	1,685
Polk	481	427	113	60	96	89	69	25	29	639
Pottawattamie	73	71	19	17	24	11	0	1	1	1,190
Poweshiek	12	11	9	0	2	0	0	0	1	1,649
Ringgold	2	2	2	0	0	0	0	0	0	3,575
Sac	11	11	11	0	0	0	0	0	0	1,476
Scott	154	143	52	22	40	25	7	0	11	863
Shelby	8	8	7	1	0	0	0	0	0	1,975
Sioux	11	10	8	1	1	0	0	1	0	2,642
Story	71	63	24	12	13	7	7	2	6	866
Tama	9	9	9	0	0	0	0	0	0	2,265
Taylor	8	7	6	0	0	1	0	0	1	1,353
Union	17	16	8	1	4	3	0	0	1	831
Van Buren	8	7	7	0	0	0	0	0	1	1,340
Wapello	53	50	21	6	11	11	1	0	3	892
Warren	13	10	8	0	0	2	0	0	3	2,171
Washington	14	12	11	0	0	1	0	0	2	1,582
Wayne	7	5	4	0	1	0	0	0	2	1,744

Continued

Table 3. Non-Federal Physicians (M.D. & D.O.) by County, State, and Region: Iowa 1967[a]

County	Total Physicians (MD & DO)	Patient Care							Other Activity	Inactive & No Information	Population-Patient Care Physician Ratio
		Total Patient Care	Solo, Partnership, Group or Other Practice				Hospital Based				
			General Practice	Specialties							
				Medical	Surgical	Other					
Webster	62	58	21	9	15	12	1		1	3	825
Winnebago	7	7	7	0	0	0	0		0	0	1,813
Winneshiek	12	12	10	0	1	1	0		0	0	1,637
Woodbury	132	124	49	20	43	9	3		0	8	852
Worth	5	5	5	0	0	0	0		0	0	1,794
Wright	14	14	13	0	1	0	0		0	0	1,343
Region 1	41	40	36	1	2	1	0		0	1	1,738
Region 2	151	145	89	16	28	11	3		0	6	1,082
Region 3	83	75	62	2	5	6	0		1	7	1,440
Region 4	215	198	93	22	47	15	21		6	11	1,063
Region 5	124	120	77	10	20	12	1		1	3	1,075
Region 6	83	80	51	3	19	6	1		0	3	1,110
Region 7	225	216	87	14	49	29	27		3	6	1,114
Region 8	95	87	32	15	28	12	0		1	7	1,449
Region 9	235	217	88	29	57	35	8		1	17	1,000
Region 10	793	601	143	26	57	38	338		168	24	500
Region 11	678	607	224	72	120	106	83		28	43	777
Region 12	72	69	53	2	10	4	0		0	3	1,397
Region 13	165	154	79	19	32	13	10		5	6	1,225
Region 14	48	44	33	2	4	5	0		0	4	1,377
Region 15	145	135	84	13	22	13	2		0	10	1,181
Region 16	133	123	47	10	32	25	9		3	7	982
State	3,286	2,911	1,278	256	532	331	503		272	158	946

[a] Tables 1 and 2.

Table 4. Medical Physicians (M.D.) by Specialty and Major Professional Activity: Iowa, 1967[a]

Specialty	Total M.D.	Patient Care					Other Activity[b]
		Total Patient Care	Solo, Partnership, Group, or Other Practice	Hospital Based Practice			
				Interns	Residents and Fellows	Full-Time Physician Staff	
Total Physicians	2,889	2,566	2,078	77	304	107	197
General Practice	1,071	1,063	1,040	5	6	12	8
Medical Specialties	409	348	248	15	67	18	61
Allergy	9	7	7	0	0	0	2
Cardiovascular diseases	2	1	0	0	1	0	1
Dermatology	34	31	22	0	8	1	3
Gastroenterology	3	3	2	0	1	0	0
Internal Medicine	253	214	152	10	43	9	39
Pediatrics	103	89	65	5	14	5	14
Pediatric Allergy	0	0	0	0	0	0	0
Pediatric Cardiology	2	1	0	0	0	1	1
Pulmonary Disease	3	2	0	0	0	2	2
Surgical Specialties	719	666	510	9	141	6	53
General Surgery	253	241	195	7	37	2	12
Neurological Surgery	20	17	10	0	6	1	3
Obstetrics and Gynecology	114	105	90	2	12	1	9
Ophthalmology	113	104	73	0	31	0	9
Orthopedic Surgery	66	61	45	0	16	0	5
Otolaryngology	67	61	42	0	18	1	6
Plastic Surgery	6	5	4	0	1	0	1
Colon and Rectal Surgery	5	5	5	0	0	0	0
Thoracic Surgery	8	4	4	0	0	0	4
Urology	67	63	42	0	20	1	4
Other Specialties	564	489	280	48	90	71	75
Aviation Medicine	0	0	0	0	0	0	0
Anesthesiology	94	92	76	0	12	4	2
Child Psychiatry	4	3	1	0	1	1	1
Diagnostic Radiology	0	0	0	0	0	0	0
Forensic Pathology	0	0	0	0	0	0	0

Table 4. Medical Physicians (M.D.) by Specialty and Major Professional Activity: Iowa, 1967[a]

		Patient Care					
				Hospital Based Practice			
Specialty	Total M.D.	Total Patient Care	Solo, Partnership, Group, or Other Practice	Interns	Residents and Fellows	Full-Time Physician Staff	Other Activity[b]
Neurology	22	17	3	0	12	2	5
Occupational Medicine	7	6	6	0	0	0	1
Psychiatry	159	137	64	0	33	40	22
Pathology	76	64	37	0	14	13	12
Physical Medicine and Rehabilitation	7	5	4	0	1	0	2
General Preventive Medicine	1	1	1	0	0	0	0
Public Health	5	3	3	0	0	0	2
Radiology	109	101	80	0	15	6	8
Therapeutic Radiology	1	1	1	0	0	0	0
Not Recognized	19	5	2	0	2	1	14
Unspecified	60	54	2	48	0	4	6
Inactive	126						

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[a] Distribution of Physicians, Hospitals and Hospital Beds in the U.S., 1967, Department of Survey Research, American Medical Association, Chicago, 1968.

[b] Includes medical school faculty, administration, and research positions.

Table 5. Doctors of Osteopathy by Specialty and Major Professional Activity[a]: Iowa, 1967

		Patient Care					
				Hospital Based Practice			
Specialty	Total	Total Patient Care	Solo, Partnership, Group or Other Practice	Interns	Residents and Fellows	Full-Time Physician Staff	Other Activity[b]
Total Physicians	397	345	328	4	7	6	16
General Practice	248	248	248	0	0	0	0
Medical Specialties	11	9	9	0	0	0	2
Allergy	1	1	1	0	0	0	0
Dermatology	1	1	1	0	0	0	0
Internal Medicine	9	7	7	0	0	0	2
Pediatrics	0	0	0	0	0	0	0
Surgical Specialties	27	26	22	0	3	1	1
Gynecology	2	2	2	0	0	0	0
Opthalmology and Oto.	5	5	5	0	0	0	0
Obstetrical-Gynecological Surgery	2	1	1	0	0	0	1
Opthalmology	2	2	2	0	0	0	0
General Surgery	16	16	12	0	3	1	0
Other Specialties	75	62	49	4	4	5	13
Anesthesiology	7	7	7	0	0	0	0
Anatomic Pathology	1	0	0	0	0	0	1
Psychiatry	2	1	1	0	0	0	1
Pathology	2	2	1	0	1	0	0
Physical Medicine and Rehabilitation	1	0	0	0	0	0	1
Radiology	3	3	1	0	1	1	0
Endocrinology	3	3	3	0	0	0	0
Proctology	2	2	2	0	0	0	0
Roetgenology	3	3	1	0	0	2	0
Unspecified	18	8	0	4	2	2	10
Manipulative Therapy	31	31	31	0	0	0	0
Not Recognized	2	2	2	0	0	0	0
Inactive	17						
No Information	19						

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[a] American Osteopathic Association Yearbook and Directory of Osteopathic Physicians, 1968. American Osteopathic Association, Chicago, Illinois.

[b] Includes medical school faculty, administration and research positions.

Table 6. Physicians (M.D. & D.O.) By Major Professional Activity: Iowa, 1967[a]

Specialty	Total Physician	Patient Care					Other Activity[b]
				Hospital Based Practice			
		Total Patient Care	Solo, Partnership, Group or Other Practice	Interns	Residents and Fellows	Full-Time Hospital Staff	
Total Physicians	3,286	2,911	2,406	81	311	113	213
General Practice	1,319	1,311	1,288	5	6	12	8
Medical Specialties	420	357	257	15	67	18	63
Surgical Specialties	746	692	532	9	144	7	54
Other Specialties	639	551	329	52	94	76	88
Inactive	143	0	0	0	0	0	0
No Information	19	0	0	0	0	0	0

[a] Tables 4 and 5.

Table 7. County Population Per Practicing Medical Physician by Decade in Iowa: 1910-1960

County	1910	1920	1930	1940	1950	1960
Adair	800	890	1,389	1,320	1,366	2,178
Adams	845	959	1,493	1,692	2,183	2,487
Allamakee	694	960	1,020	1,145	1,485	1,778
Appanoose	718	825	1,034	1,350	1,310	1,232
Audubon	1,055	1,139	1,361	1,308	2,318	1,820
Benton	723	861	1,040	1,040	1,192	1,675
Black Hawk	504	690	854	1,000	1,153	1,093
Boone	710	695	1,085	1,365	1,279	1,754
Bremer	689	880	897	945	1,177	1,405
Buchanan	564	685	752	808	1,216	1,239
Buena Vista	728	975	982	1,043	1,171	1,628
Butler	658	810	1,037	1,199	1,739	2,498
Calhoun	610	712	735	837	997	1,328
Carroll	694	653	798	785	888	1,118
Cass	680	608	748	982	1,323	1,493
Cedar	613	799	838	936	1,410	1,779
Cerro Gordo	642	630	726	913	853	767
Cherokee	493	522	852	802	953	930
Chickasaw	699	1,188	860	953	663	1,367
Clarke	632	618	944	1,023	1,560	1,370
Clay	637	1,118	1,240	986	1,292	1,541
Clayton	751	737	981	937	1,021	1,828
Clinton	677	735	944	878	975	1,148
Crawford	786	795	1,169	1,365	1,410	2,650
Dallas	607	661	654	633	912	1,420
Davis	556	740	857	1,011	830	835
Decatur	585	690	1,063	1,272	1,260	1,173
Delaware	893	957	1,007	803	1,970	2,640
Des Moines	623	670	795	995	1,001	970
Dickinson	738	853	1,098	1,013	1,417	1,257
Dubuque	765	738	850	873	1,080	1,039
Emmet	701	574	858	960	1,007	993
Fayette	665	751	910	833	976	1,298
Floyd	635	787	888	1,008	1,130	1,241
Franklin	870	990	1,363	1,091	1,250	2,212
Fremont	434	736	971	977	1,028	1,610
Greene	697	686	827	692	778	1,026
Grundy	715	802	1,089	1,230	1,248	1,768
Gutherie	527	705	963	1,077	1,686	1,943
Hamilton	740	752	1,049	949	1,330	1,670
Hancock	749	775	1,645	1,712	1,675	2,920
Hardin	486	729	819	805	1,112	1,324
Harrison	701	818	1,131	1,138	1,221	1,957
Henry	352	572	707	783	936	910
Howard	809	857	1,189	1,230	1,311	1,821
Humboldt	870	998	1,320	1,922	1,312	1,462
Ida	595	649	996	1,004	1,338	1,710
Iowa	683	664	754	1,001	1,131	1,170
Jackson	625	665	923	1,065	1,330	2,075
Jasper	563	619	890	927	1,346	1,763

Continued

Table 7. County Population Per Practicing Medical Physician by Decade in Iowa: 1910-1960

County	1910	1920	1930	1940	1950	1960
Jefferson	694	610	813	750	1208	1339
Johnson	405	270	221	236	271	326
Jones	615	886	1,200	1,248	1,387	1,380
Keokuk	450	873	737	801	988	2,215
Kossuth	845	1,253	1,212	1,480	1,381	2,300
Lee	525	611	751	775	1,105	1,162
Linn	494	536	720	775	828	1,100
Louisa	612	609	724	759	1,389	1,713
Lucas	585	870	841	1,040	1,207	1,823
Lyon	697	909	1,390	1,280	2,100	2,410
Madison	680	715	897	1,320	2,190	2,050
Mahaska	711	657	993	1,019	1,121	1,241
Marion	522	756	735	845	1,522	1,724
Marshall	541	640	702	787	810	1,000
Mills	660	735	794	1,004	2,009	1,867
Mitchell	747	820	879	884	775	1,404
Monona	665	857	1,140	1,230	1,252	1,263
Monroe	910	1,120	1,250	1,119	1,181	2,092
Montgomery	639	656	839	873	921	1,313
Muscatine	670	745	889	1,042	1,236	1,251
O'Brien	639	657	1,022	919	1,052	1,449
Osceola	746	852	1,018	1,179	926	2,518
Page	511	652	835	804	798	915
Palo Alto	770	1,031	1,183	1,242	1,132	1,339
Plymouth	964	1,121	1,050	904	1,550	2,173
Pocahontas	705	679	871	814	1,550	1,423
Polk	417	537	642	631	779	989
Pottawattamie	754	790	884	1,042	968	1,063
Poweshiek	530	665	853	939	1,209	2,143
Ringgold	586	760	1,088	1,114	1,902	3,958
Sac	789	834	1,176	840	1,460	2,427
Scott	582	626	716	840	950	1,253
Shelby	828	765	1,713	1,520	2,280	1,980
Sioux	842	980	1,218	1,431	1,550	2,398
Story	524	569	692	798	1,267	1,120
Tama	651	625	845	1,019	1,354	1,787
Taylor	628	775	1,060	1,782	2,486	3,430
Union	573	639	793	1,162	1,118	1,056
Van Buren	470	541	970	1,004	1,832	3,258
Wapello	572	612	765	990	1,078	888
Warren	627	820	932	1,049	1,971	2,978
Washington	554	574	902	1,052	932	1,492
Wayne	521	591	810	1,210	1,468	1,400
Webster	722	698	722	884	805	886
Winnebago	792	963	1,011	821	960	1,310
Winneshiek	988	1,104	1,140	1,310	1,548	2,410
Woodbury	578	580	742	779	811	869
Worth	995	1,163	1,397	1,908	2,213	2,051
Wright	780	847	880	837	936	1,143

APPENDIX B

Table 1. Registered Nurses with Active Licenses to Practice in Relation to Population for Selected Years: Iowa and United States

	Years		
Iowa	1962[a]	1966[b]	1967[c]
Total Licensed to Practice	15,592	14,990	15,380
Employed	8,555	9,956	10,791
Not Employed	6,389	4,996	4,512
Employment not Reported	648	38	77
Resident Population per Employed Nurse	311	276	256[d]
United States			
Total Licensed to Practice	847,551	909,131	n.a.
Employed	532,118	593,643	640,000
Not Employed	282,819	285,791	n.a.
Employment not Reported	32,594	29,646	n.a.
Resident Population per Employed Nurse	336	319	308

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[a] *Facts About Nursing: A Statistical Summary, 1968 Edition*, (New York: American Nurses' Association, 1968), pp. 11-12.

[b] *Facts About Nursing: A Statistical Summary, 1968 Edition*, (New York: American Nurses' Association, 1968), pp. 13-15.

[c] Iowa data was provided by the Iowa Board of Nursing, December, 1967. U. S. estimates were taken from *Facts About Nursing: A Statistical Summary, 1968 Edition*, (New York: American Nurses' Association, 1968), p. 10.

[d] The estimate of Iowa's 1967 population was taken from the U. S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, D.C., p. 12.

Table 2. Registered Nurses with "Active" Licenses to Practice in Relation to Population by Region and County: Iowa, 1967

	Total Number of Registered Nurses with Active Licenses (December, 1967)[a]	Estimates of Iowa's 1967 Population[b]	Population per Registered Nurse with Active License
State Total	15,344	2,752,000	179
Region I	210	69,540	331
Allamakee	27	15,960	591
Clayton	71	21,490	303
Howard	34	12,440	366
Winneshiek	78	19,650	252
Region II	731	156,960	215
Cerro Gordo	298	48,570	163
Floyd	95	20,860	220
Franklin	37	13,730	371
Hancock	55	13,910	253
Kossuth	115	24,550	213
Mitchell	50	13,680	274
Winnebago	46	12,690	276
Worth	35	8,970	256
Region III	512	107,970	211
Buena Vista	103	20,640	200
Clay	86	17,990	209
Dickinson	48	12,820	267
Emmet	67	14,280	213
O'Brien	99	18,990	192
Osceola	25	8,970	359
Palo Alto	84	14,280	170
Region IV	1,312	210,450	160
Cherokee	131	17,690	135
Ida	44	9,410	214
Lyon	37	14,020	379
Monona	53	13,040	246
Plymouth	148	24,220	164
Sioux	113	26,420	234
Woodbury	786	105,650	134
Region V	766	128,960	168
Calhoun	81	15,880	196
Hamilton	112	19,950	178
Humboldt	53	12,990	245
Pocahontas	61	13,480	221
Webster	368	47,860	130
Wright	91	18,880	207
Region VI	573	97,840	171
Hardin	117	21,660	185
Marshall	294	37,650	128
Poweshiek	81	18,140	224
Tama	81	20,390	252
Region VII	1,146	240,640	210
Black Hawk	654	125,360	192
Bremer	111	20,940	189
Buchanan	94	20,450	218
Butler	61	16,290	267
Chickasaw	63	14,450	229
Fayette	98	29,120	297
Grundy	65	14,030	216
Region VIII	833	126,040	151
Delaware	75	17,030	227
Dubuque	657	88,120	134
Jackson	101	20,890	207
Region IX	1,340	216,960	166
Clinton	398	56,270	141
Muscatine	196	34,680	177
Scott	746	126,010	170
Region X	2,293	301,230	131
Benton	63	22,510	357
Cedar	72	18,050	251
Iowa	78	16,590	213
Johnson	915	59,310	65
Jones	98	20,060	205
Linn	912	145,720	159
Washington	155	18,990	123
Region XI	2,702	470,950	174
Boone	122	25,620	210
Dallas	131	23,360	178
Jasper	118	34,730	294
Madison	36	11,970	333
Marion	142	26,170	184
Polk	1,723	272,810	158
Story	360	54,580	152
Warren	70	21,710	311
Region XII	497	96,380	194
Audubon	38	10,020	264
Carroll	165	24,300	147
Crawford	79	19,540	247
Greene	92	13,290	144
Guthrie	57	12,990	228
Sac	66	16,240	246
Region XIII	863	188,590	219
Cass	78	18,080	232
Fremont	25	9,880	395
Harrison	44	16,840	383
Mills	38	11,370	299
Montgomery	57	13,070	229
Page	82	19,040	232
Pottawattamie	445	84,510	190
Shelby	94	15,800	168
Region XIV	186	60,600	344
Adair	27	9,330	346
Adams	16	6,360	398

	Total Number of Registered Nurses with Active Licenses (December, 1967)[a]	Estimates of Iowa's 1967 Population[b]	Population per Registered Nurse with Active License
Clarke	16	7,620	476
Decatur	29	7,380	254
Ringgold	19	7,150	376
Taylor	18	9,471	526
Union	61	13,290	218
Region XV	698	158,040	226
Appanoose	53	15,270	288
Davis	41	8,780	214
Jefferson	89	14,890	167
Keokuk	77	15,250	198
Lucas	35	10,130	289
Mahaska	102	21,600	212
Monroe	40	9,410	235
Van Buren	24	9,380	391
Wapello	217	44,610	206
Wayne	20	8,720	436
Region XVI	682	120,850	177
Des Moines	304	47,720	157
Henry	122	17,590	144
Lee	216	44,860	208
Louisa	40	10,680	267

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[a] Data provided by the Iowa Board of Nursing, December, 1967. The reader may note that the sum of all registered nurses licensed to practice in Iowa according to the above data is 15,344. Table 1 shows that 15,380 registered nurses were licensed to practice in Iowa for the same time period. The discrepancy of 36 nurses is a result of the fact that these 36 reported their state of residence but for one reason or another their information regarding their address was foiled.

[b] Estimates of Iowa's population for 1967 were provided by the Records and Statistics Division of the Iowa State Department of Health.

Table 3. Age Distribution of Iowa's Registered Nurses: August-September, 1968 [a]

Age[b]	Per Cent	Standard Error	Cell Size
25 and under	11.85	.91	149
26-30	17.26	1.07	217
31-35	14.16	.98	178
36-40	12.73	.94	160
41-45	17.34	1.07	218
46-50	9.15	.81	115
51-55	6.13	.68	77
56-60	7.88	.70	99
61-65	2.86	.47	36
Over 65	.64	.22	8
Not Reporting[c]	—	—	16

Table 3. Age Distribution of Iowa's Registered Nurses: August-September, 1968 [a]

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents in the sample survey who failed to report their year of graduation from basic nursing education program.

[c] The age variable was calculated by taking the differences between the year of graduation from basic nursing education and 1968 plus 21.

Table 5. Percentage Distribution of Iowa's Registered Nurses by Type of Basic Nursing Education Program: August-September, 1968

Program	Percentage	Standard Error	Cell Size
Associate Degree Program	2.61	.45	33
Hospital School Program	89.09	.88	1,127
Baccalaureate Degree Program	6.09	.67	77
Diploma plus B.S.	1.98	.39	25
ADN plus B.S.	0.00	0.00	0
Others	.24	.14	3
Not Reporting[b]	—	—	8

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who failed to report their basic education.

Table 4. Percentage Distribution of Iowa's Registered Nurses by Marital Status: August-September, 1968[a]

	Married	Divorced	Widowed	Separated	Single	Not Reporting[b]
Percentage	85.89	2.00	3.69	.56	7.86	--
Standard Error	.99	.40	.53	.21	.76	--
Cell Size	1071	25	46	7	98	26

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[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Number of respondents to the sample survey who failed to report their marital status.

Table 6. Percentage of Iowa's Registered Nurses Employed by Marital Status: August-September, 1968[a]

	Married	Divorced	Widowed	Separated	Single
Over-all Percentage Employed[b]					
Percentage	58.27	80.00	82.61	100.00	86.73
Standard Error	1.51	8.17	5.65	0.0	3.44
Percentage Employed Full-time					
Percentage	27.16	76.00	71.74	71.43	78.57
Standard Error	1.36	8.72	6.71	18.44	4.17
Cell Size	1064	25	46	7	98
Not Reporting[c]	7	0	0	0	0

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Over-all percentage employed refers to the percentage of registered nurses working either full-time, part-time, or on an irregular basis.

[c] Number of respondents to the sample survey who reported their marital status but failed to report their employment status.

Table 7. Percentage of Iowa's Registered Nurses Employed by Age Category: August-September, 1968[a]

	Over-all Percentage Employed[b]		Percentage Employed Full-Time			
Age	Percent	Standard Error	Percent	Standard Error	Cell Size	Not Reporting[c]
25 and Under	75.17	3.55	51.01	4.11	149	--
26-30	57.21	3.38	22.33	2.85	215	2
31-35	56.25	3.75	21.02	3.08	176	2
36-40	62.50	3.84	24.37	3.41	160	--
41-45	68.81	3.15	37.41	3.29	218	--
46-50	65.48	4.49	49.56	4.72	113	2
51-55	61.84	5.61	43.42	5.72	76	1
56-60	60.00	5.00	47.00	5.18	99	--
61-65	33.33	7.97	22.22	7.03	36	--
Over 65	0.00	0.00	0.00	0.00	8	--

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Over-all percentage employed refers to the percentage of registered nurses working either full-time, part-time, or on an irregular basis.

[c] Number of respondents to the sample survey who failed to report their employment status.

Table 9. Percentage Distribution of Iowa's Inactive Registered Nurses by Marital Status: August-September, 1968[a]

	Married	Divorced	Widowed	Separated	Single	Not Reporting[b]
Percentage	94.47	1.06	1.70	0.00	2.77	--
Standard Error	1.06	.47	.60	0.00	.76	--
Cell Size	444	5	8	0.00	13	10

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[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Number of respondents to the sample survey who reported they were not employed, but failed to report their marital status.

Table 8. Age Distribution of Iowa's Inactive Registered Nurses: August-September, 1968[a]

Age[b]	Percentage	Standard Error	Cell Size
25 and Under	7.92	1.25	37
26-30	19.70	1.84	92
31-35	16.49	1.72	77
36-40	12.85	1.55	60
41-45	14.56	1.63	68
46-50	8.35	1.28	39
51-55	6.21	1.12	29
56-60	7.06	1.15	33
61-65	5.14	1.02	24
Over 65	1.71	.60	8
Not Reporting[c]	—	—	13

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] The age variable was calculated by taking the difference between the year of graduation from basic nursing education and 1968 plus 21.

[c] Number of respondents to the sample survey who reported that they were not employed, but failed to report the year they graduated from basic nursing education program.

Table 10. Future Work Plans of Iowa's Inactive Registered Nurses: August-September, 1968[a]

	Plan to Return	Do Not Plan to Return	Undecided	Not Reporting[b]
Percentage	38.98	22.04	38.98	—
Standard Error	2.30	1.95	2.30	—
Cell Size	175	99	175	31

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

[b] Number of respondents to the sample survey who reported they were not employed, but failed to report their future work plans.

APPENDIX C

Table 1. Licensed Practical Nurses with "Active" Licenses to Practice in Relation to Population by Region and County: Iowa, 1967

	Total Number of Licensed Practical Nurses with Active Licenses (December, 1967)[a]	Estimates of the Iowa's 1967 Population[b]	Population per Licensed Practical Nurse with Active License
State Total	3638	2,752,000	756
Region I	64	69,540	1087
Allamakee	16	15,960	998
Clayton	24	21,490	895
Howard	8	12,440	1555
Winneshiek	16	19,650	1228
Region II	170	156,960	923
Cerro Gordo	79	48,570	615
Floyd	23	20,860	907
Franklin	9	13,730	1526
Hancock	9	13,910	1545
Kossuth	15	24,550	1637
Mitchell	18	13,680	760
Winnebago	8	12,690	1586
Worth	9	8,970	997
Region III	82	107,970	1317
Buena Vista	9	20,640	2293
Clay	7	17,990	2570
Dickinson	16	12,820	801
Emmet	20	14,280	714
O'Brien	15	18,990	1266
Osceola	8	8,970	1121
Palo Alto	7	14,280	2040
Region IV	250	210,450	842
Cherokee	37	17,690	478
Ida	8	9,410	118
Lyon	9	14,020	1558
Monona	9	13,040	1449
Plymouth	17	24,220	1425
Sioux	27	26,420	979
Woodbury	143	105,650	739
Region V	118	128,960	1093
Calhoun	27	15,880	588
Hamilton	18	19,950	1108
Humboldt	8	12,990	1624
Pocahontas	14	13,480	963
Webster	41	47,860	1167
Wright	10	18,880	1888
Region VI	155	97,840	631
Hardin	25	21,660	866
Marshall	88	37,650	428
Poweshiek	14	18,140	1296
Tama	28	20,390	728
Region VII	367	240,640	656
Black Hawk	249	125,360	514
Bremer	21	20,940	997
Buchanan	26	20,450	787
Butler	12	16,290	1358
Chickasaw	16	14,450	903

	Total Number of Licensed Practical Nurses with Active Licenses (December, 1967)[a]	Estimates of the Iowa's 1967 Population[b]	Population per Licensed Practical Nurse with Active License
Fayette	32	29,120	910
Grundy	13	14,030	1079
Region VIII	174	126,040	724
Delaware	20	17,030	851
Dubuque	131	88,120	673
Jackson	23	20,890	903
Region IX	261	216,960	831
Clinton	66	56,270	853
Muscatine	25	34,680	1387
Scott	170	126,010	741
Region X	475	301,230	634
Benton	29	22,510	776
Cedar	21	18,050	860
Iowa	14	16,590	1185
Johnson	137	59,310	433
Jones	28	20,060	716
Linn	214	145,720	681
Washington	32	18,990	593
Region XI	661	470,950	712
Boone	31	25,620	826
Dallas	52	23,360	449
Jasper	28	34,730	1240
Madison	9	11,970	1330
Marion	29	26,170	902
Polk	423	272,810	645
Story	79	54,580	691
Warren	10	21,710	2171
Region XII	155	96,380	622
Audubon	6	10,020	1670
Carroll	79	24,300	308
Crawford	19	19,540	1028
Greene	18	13,290	738
Guthrie	11	12,990	1181
Sac	22	16,240	738
Region XIII	275	188,590	686
Cass	20	18,080	904
Fremont	24	9,880	412
Harrison	17	16,840	991
Mills	25	11,370	455
Montgomery	17	13,070	769
Page	78	19,040	244
Pottawattamie	75	84,510	1127
Shelby	19	15,800	832
Region XIV	65	60,600	932
Adair	4	9,330	2333
Adams	5	6,360	1272
Clarke	5	7,620	1524
Decatur	8	7,380	923
Ringgold	4	7,150	1788
Taylor	23	9,471	412
Union	17	13,290	782
Region XV	274	158,040	577
Appanoose	33	15,270	463
Davis	5	8,780	1756
Jefferson	14	14,890	1064
Keokuk	13	15,250	1173
Lucas	19	10,130	533
Mahaska	25	21,600	864
Monroe	20	9,410	471
Van Buren	12	9,380	782
Wapello	126	44,610	354
Wayne	7	8,720	1246
Region XVI	92	120,850	1314
Des Moines	32	47,720	1491
Henry	21	17,590	838
Lee	28	44,860	1602
Louisa	11	10,680	971

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[a] Data provided by the Iowa Board of Nursing, December, 1967. The reader should note that a discrepancy of two licensed practical nurses exists when comparing the state total in this table with that of Table 1 in the text. This discrepancy resulted because the county of residence of two Iowa licensed practical nurses was not known.

[b] Estimates of Iowa's population for 1967 were provided by the Records and Statistics Division of the Iowa State Department of Health.

Table 2. Age Distribution of Iowa's Licensed Practical Nurses: August-September, 1968 [a]

Age	Percent	Standard Error	Cell Size
20 and Under	1.96	.97	4
21-25	24.51	3.02	50
26-30	14.71	2.49	30
31-35	9.31	2.04	19
36-40	9.80	2.08	20
41-45	8.33	1.94	17
46-50	9.31	2.04	19
51-55	5.88	1.65	12
56-60	11.76	2.29	24
61-65	4.41	1.44	9

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[a] Data provided by the Health Economics Research Center, Department of Economics, The University of Iowa.

Table 3. Percentage Distribution of Iowa's Licensed Practical Nurses by Marital Status: August-September 1968 [a]

	Married	Divorced	Widowed	Separated	Single	Not Reporting [b]
Percentage	77.11	7.46	2.98	2.49	9.95	- -
Standard Error	2.97	1.86	1.20	1.10	2.12	- -
Cell Size	155	15	6	5	20	3

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[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Number of respondents to the sample survey who failed to report their marital status.

Table 4. Percentage of Iowa's Licensed Practical Nurses Employed, by Marital Status: August-September, 1968[a]

	Married	Divorced	Widowed	Separated	Single
Over-all Percentage Employed[b]					
Percentage	66.24	80.00	100.00	100.00	95.00
Standard Error	3.79	10.69	0.00	0.00	5.00
Percentage Employed Full-time					
Percentage	39.50	60.00	83.33	100.00	90.00
Standard Error	3.91	13.09	16.67	0.00	6.88
Cell Size	158	15	6	5	20
Not Reporting[c]	1	-----	-----	-----	-----

[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Over-all percentage employed refers to the percentage of licensed practical nurses working either full-time, part-time, or on an irregular basis.

[c] Number of respondents to the sample survey who reported their marital status but failed to report their employment status.

Table 5. Percentage of Iowa's Licensed Practical Nurses Employed by Age Category: August-September, 1968[a]

	Over-all Percentage Employed[b]		Percentage Employed Full-Time			
Age	Percent	Standard Error	Percent	Standard Error	Cell Size	Not Reporting[c]
20 and Under	100.00	0.00	100.00	0.00	4	--
21-25	48.00	7.14	36.00	6.86	50	--
26-30	60.00	9.10	20.00	7.43	30	--
31-35	89.47	7.23	57.90	11.64	19	--
36-40	80.00	9.18	50.00	11.47	20	--
41-45	82.35	9.53	70.59	11.39	17	--
46-50	89.47	7.23	63.16	11.37	19	--
51-55	100.00	0.00	58.33	14.86	12	--
56-50	70.83	9.14	56.05	9.45	24	1
61-65	77.78	14.47	66.67	16.67	9	--

[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Over-all percentage employed refers to the percentage of licensed practical nurses working either full-time, part-time, or on an irregular basis.

[c] Number of respondents to the sample survey who failed to report their employment status.

Table 6. Age Distribution of Iowa's Inactive Licensed Practical Nurses: August-September, 1968[a]

Age	Percentage	Standard Error	Cell Size
20 and Under	0.00	0.00	0
21-25	45.61	6.66	26
26-30	21.05	5.45	12
31-35	3.51	2.46	2
36-40	7.02	3.41	4
41-45	5.26	2.98	3
46-50	3.51	2.46	2
51-55	0.00	0.00	0
56-60	10.53	4.10	6
61-65	3.51	2.46	2
Mean Age	32.37	12.84	57

[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

Table 7. Percentage Distribution of Iowa's Inactive Licensed Practical Nurses by Marital Status: August-September, 1968[a]

	Married	Divorced	Widowed	Separated	Single
Percentage	92.98	5.26	0.00	0.00	1.75
Standard Error	3.41	2.98	0.00	0.00	1.75
Cell Size	53	3	0	0	1

Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

Table 8. Future Work Plans of Iowa's Inactive Licensed Practical Nurses: August-September, 1968[a]

	Plan to Return	Do Not Plan to Return	Undecided	Not Reporting[b]
Percentage	37.50	8.93	53.57	--
Standard Error	6.53	3.84	6.72	--
Cell Size	21	5	30	1

[a] Data provided by the Health Economics Research Center, Department of Economics, University of Iowa.

[b] Number of respondents to the sample survey who reported they were not employed, but failed to report their future work plans.

APPENDIX D

Table 1. Active Dentist in Relation to Population for Selected Years: Iowa and the United States

	1950	1952	1955	1960	1965	1967	1968
Iowa[a]							
Active Dentists	- -	1,387	- -	1,231[c]	1,257[d]	- -	1,380
Resident Population per active Dentist	- -	1,890	- -	2,198	2,242	- -	1,994
United States[b]							
Active non-Federal Dentists	75,313	- -	76,087	82,630	86,317	90,716	- -
Resident Civilian Population per active non-Federal Dentist	2,002	- -	2,141	2,156	2,223	2,156	- -

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[a] The data for 1952 and 1960 were taken from data sheets entitled "Distribution of Iowa Dentists by County," provided by the Dental Health Division, Iowa State Department of Health. The 1965 data were taken from *1965 Survey of Dentists Licensed in Iowa* (November, 1967), and the 1968 data were taken from *A Profile of Iowa Dentists: 1968* (Dental Health Division, Iowa State Department of Health).

[b] National Center for Health Statistics, *Health Resources Statistics, 1965* and *1968*, Public Health Service, Washington, D.C.

[c] Does not include 46 orthodontists, 34 oral surgeons, and the faculty of the College of Dentistry, The University of Iowa, Iowa City, Iowa.

[d] Figure may be an underestimate since eight percent of the dentists registered with the Iowa State Board of Dental Examiners, some of whom resided in Iowa, did not respond to the survey.

Table 2. Active Dentists[a] in Relation to Population: Iowa, 1965 and 1968

	Number of Active Dentists		Population		Population per Active Dentist	
	1965[b]	1968[c]	1965[d]	1968[e]	1965	1968
State Total	1,257	1,380	2,818,300	2,752,000	2.242	1,994
Region I	30	34	71,800	69,540	2,393	2,045
Allamakee	7	9	16,000	15,960	2,286	1,773
Clayton	9	9	21,700	21,490	2,411	2,388
Howard	5	7	12,600	12,400	2,520	1,777
Winneshiek	9	9	21,500	19,650	2,389	2,183
Region II	77	88	163,500	156,960	2,123	1,784
Cerro Gordo	30	31	51,000	48,570	1,821	1,567
Floyd	12	14	21,000	20,860	1,750	1,490
Franklin	3	6	15,100	13,730	5,033	2,288
Hancock	5	5	14,500	13,910	2,900	2,782
Kossuth	8	11	25,300	24,550	3,163	2,232
Mitchell	9	6	14,100	13,680	1,567	2,280
Winnebago	7	12	12,800	12,690	2,133	1,058
Worth	3	3	9,700	8.970	3,233	2,990
Region III	52	58	110,500	107,970	2,125	1,862
Buena Vista	12	14	21,100	20,640	1,758	1,474
Clay	12	10	18,600	17,990	1,550	1,799
Dickinson	7	9	12,400	12,820	1,771	1,424
Emmet	6	9	15,000	14,280	2.500	1,587
O'Brien	9	9	18,800	18,990	2,089	2,110
Osceola	3	3	10,000	8,970	3,333	2,990
Palo Alto	3	4	14,600	14,280	4,867	3,570
Region IV	105	100	217,400	210,450	2,070	2,105
Cherokee	10	11	18,700	17,690	1,870	1,608
Ida	4	4	9,900	9,410	2,475	2,353
Lyon	5	4	14,400	14,020	2,880	3,505

Table 2. Active Dentists[a] in Relation to Population: Iowa, 1965 and 1968

	Number of Active Dentists		Population		Population per Active Dentist	
	1965[b]	1968[c]	1965[d]	1968[e]	1965	1968
Monona	6	3	13,400	13,040	2,231	4,347
Plymouth	12	12	24,200	24,220	2,017	2,018
Sioux	12	12	26,600	26,420	2,217	2,202
Woodbury	56	54	110,200	105,650	1,968	1,956
Region V	56	61	131,600	128,960	2,350	2,114
Calhoun	7	8	15,900	15,880	2,271	1,985
Hamilton	5	10	20,200	19,950	4.040	1,995
Humboldt	6	6	13,100	12,990	2,183	2,165
Pocahontas	6	7	13,900	13,480	2,317	1,926
Webster	23	22	49,000	47,860	2,130	2,175
Wright	9	8	19,500	18,800	2,167	2,350
Region VI	42	49	101,200	97,840	2,410	1,997
Hardin	12	12	22,800	21,660	1,900	1,805
Marshall	16	22	38,200	37,650	2,387	1,711
Poweshiek	6	7	19,100	18,140	3,183	2,591
Tama	8	8	21,100	20,390	2,637	2,549
Region VII	98	101	250,000	240,640	2,552	2,383
Black Hawk	60	61	131,100	125,360	2,185	2,055
Bremer	8	11	21,600	20,940	2,700	1,904
Buchanan	7	9	22,400	20,450	3,200	2,272
Butler	3	2	17,300	16,290	5,767	8,145
Chickasaw	5	4	14,900	14,450	2,980	3,613
Fayette	10	9	28,600	29,120	2,860	3,236
Grundy	5	5	14,200	14,030	2,840	2,806
Region VIII	59	66	124,200	126,040	2,105	1,910
Delaware	3	6	18,800	17,030	6,267	2,838
Dubuque	51	53	84,000	88,120	1,647	1,663
Jackson	5	7	21,400	20,890	4,280	2,984
Region IX	97	106	220,800	216,960	2,276	2,047
Clinton	26	29	57,600	56,270	2,215	1,940
Muscatine	14	15	34,300	34,680	2,450	2,312
Scott	57	62	128,900	126,010	2,261	2,032
Region X	179	225	303,100	301,230	1,693	1,339
Benton	5	6	23,500	22,510	4,700	3,752
Cedar	6	7	18,000	18,050	3,000	2,759
Iowa	10	9	16,600	16,590	1,660	1,843
Johnson	67	96	56,700	59,310	846	618
Jones	7	8	20,800	20,060	2,971	2,508
Linn	78	93	148,500	145,720	1,904	1,567
Washington	6	6	10,000	18,990	3,167	3,165
Region XI	229	249	486,200	470,950	2,123	1,891
Boone	9	9	27,800	25,620	3,089	2,847
Dallas	8	10	23,900	23,360	2,987	2,336
Jasper	13	15	36,300	34,730	2,792	2,315
Madison	4	3	11,900	11,970	2,975	3,990
Marion	14	13	26,000	26,170	1,857	2,013
Polk	153	168	286,300	272,810	1,871	1,624
Story	23	24	52,100	54,580	2,265	2,274
Warren	5	7	21,900	26,170	4,380	3,618
Region XII	31	32	97,000	96,380	3,129	3,012
Audubon	3	2	10,600	10,020	3,533	5,010
Carroll	8	10	23,800	24,300	2,975	2,430
Crawford	5	6	18,400	19,540	3,680	3,257
Greene	3	4	14,100	13,290	4,700	3,323
Guthrie	4	3	13,200	12,990	3,300	4,330
Sac	8	7	16,900	16,240	2,112	2,320
Region XIII	73	78	196,100	188,590	2,686	2,418
Cass	5	10	17,800	18,080	3,560	1,808
Fremont	2	2	9,800	9,880	4,900	4,940

Table 2. Active Dentists[a] in Relation to Population: Iowa, 1965 and 1968

	Number of Active Dentists		Population		Population per Active Dentist	
	1965[b]	1968[c]	1965[d]	1968[e]	1965	1968
Harrison	6	5	17,100	16,840	2,850	3,368
Mills	4	4	12,600	11,370	3,150	2,843
Montgomery	8	7	13,800	13,070	1,725	1,867
Page	11	13	20,100	19,040	1,827	1,465
Pottawattamie	34	32	88,900	84,510	2,615	2,641
Shelby	3	5	16,000	15,800	5,333	3,160
Region XIV	18	20	64,700	60,600	3,594	3,030
Adair	2	3	10,200	9,330	5,100	3,110
Adams	0	2	7,000	6,360		3,180
Clarke	2	3	7,700	7,620	3,850	2,540
Decatur	4	3	9,800	7,380	2,450	2,460
Ringgold	2	2	7,300	7,150	3,650	3,575
Taylor	2	2	9,500	9,470	4,750	4,735
Union	6	5	13,200	13,290	2,200	2,658
Region XV	53	57	162,300	158,040	3,062	2,773
Appanoose	4	5	15,200	15,270	3,800	3,054
Davis	3	4	8,800	8,780	2,933	2,195
Jefferson	5	6	15,500	14,890	3,100	2,482
Keokuk	4	4	15,000	15,250	3,750	3,813
Lucas	3	3	10,300	10,130	3,433	3,377
Mahaska	11	10	23,000	21,600	2,091	2,160
Monroe	3	4	9,800	9,410	3,267	2,353
Van Buren	2	3	9,300	9,380	4,650	3,127
Wapello	16	16	46,400	44,610	2,900	2,788
Wayne	2	2	9,000	8,720	4,500	4,360
Region XVI	58	56	117,800	120,850	2,031	2,158
Des Moines	32	25	45,400	47,720	1,419	1,909
Henry	9	10	17,900	17,590	1,989	1,759
Lee	15	20	44,400	44,860	2,960	2,243
Louisa	2	1	10,100	10,680	5,050	10,680

[a] "Regions" refer to the multi-county planning areas established by the Governor's Office of Planning and Programming.

[b] *1965 Survey of Dentists Licensed in Iowa* (published by the Iowa State Board of Dental Examiners and the American Association of Dental Examiners), November, 1967.

[c] *A Profile of Iowa Dentists – 1968* (unpublished paper provided by the Dental Health Division of the Iowa State Department of Health).

[d] *A Comprehensive Mental Health Plan for Iowa, Reprint No. 22, Iowa Population Trends and Characteristics* (Iowa City: Iowa Mental Health Authority, June 1, 1965).

[e] Estimates of Iowa's population for 1967 were provided by the Records and Statistics Division of the Iowa State Department of Health.

Table 3.
Population per Active Dentist for Iowa by County: 1965 and 1968[a]

County	1965	1968
Adair	5,100	3,110
Adams	0	3,180
Allamakee	2,286	1,773
Appanoose	3,800	3,054
Audubon	3,533	5,010
Benton	4,700	3,752
Black Hawk	2,185	2,055
Boone	3,089	2,847
Bremer	2,700	1,904
Buchanan	3,200	2,272
Buena Vista	1,758	1,474
Butler	5,767	8,145
Calhoun	2,271	1,985
Carroll	2,975	2,430
Cass	3.560	1,808
Cedar	3,000	2,579
Cerro Gordo	1,821	1,567
Cherokee	1,870	1,608
Chickasaw	2,980	3,613
Clarke	3,850	2,540
Clay	1,550	1,799
Clayton	2,411	2,388
Clinton	2,215	1,940
Crawford	3,680	3,257
Dallas	2,987	2,336
Davis	2,933	2,195
Decatur	2,450	2,460
Delaware	6,267	2,838
Des Moines	1,419	1,909
Dickinson	1,771	1,424
Dubuque	1,647	1,663
Emmet	2,500	1,587
Fayette	2,860	3,236
Floyd	1,750	1,490
Franklin	5,033	2,288
Fremont	4,900	4,940
Greene	4,700	3,323

Table 3.

Population per Active Dentist for Iowa by County: 1965 and 1968[a]

Grundy	2,840	2,840
Guthrie	3,300	4,330
Hamilton	4,040	1,995
Hancock	2,900	2,782
Hardin	1,900	1,805
Harrison	2,850	3,368
Henry	1,989	1,759
Howard	2,520	1,777
Humboldt	2,183	2,165
Ida	2,475	2,353
Iowa	1,660	1,843
Jackson	4,280	2,984
Jasper	2,792	2,792
Jefferson	3,100	2,482
Johnson	846	618
Jones	2,971	2,508
Keokuk	3,750	3,813
Kossuth	3,163	2,232
Lee	2,960	2,243
Linn	1,904	1,567
Louisa	5,050	10,680
Lucas	3,433	3,377
Lyon	2,880	3,505
Madison	2,975	3,990
Mahaska	2,091	2,160
Marion	1,857	2,013
Marshall	2,387	1,711
Mills	3,150	2,843
Mitchell	1,567	2,280
Monona	2,231	4,347
Monroe	3,267	2,353
Montgomery	1,725	1,867
Muscatine	2,450	2,312
O'Brien	2,089	2,110
Osceola	3,333	2,990
Page	1,827	1,465
Palo Alto	4.867	3.570
Plymouth	2,017	2,018
Pocahontas	2,317	1,926
Polk	1,871	1,624
Pottawattamie	2,615	2,641
Poweshiek	3,183	3,183
Ringgold	3,650	3,575
Sac	2,112	2,320
Scott	2,261	2,032
Shelby	5,333	3,160
Sioux	2,217	2,202
Story	2,265	2,274
Tama	2,637	2,549
Taylor	4,750	4,735
Union	2,200	2,658
Van Buren	4,650	3,127
Wapello	2,900	2,788
Warren	4,380	3,618
Washington	3,167	3,165
Wayne	4,500	4,360
Webster	2,130	2,175
Winnebago	2,133	1,058
Winneshiek	2,389	2,183
Woodbury	1,968	1,956
Worth	3,233	2,990
Wright	2,167	2,350
State	2,242	1,994

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[a] The basic data underlying this table were taken from the sources notes on Table 2 in this appendix.

Table 4.

Mean Age of Dentists for Iowa by Region and County: 1968[a]

	Mean Age
Region I	56.00
Allamakee	58.78
Clayton	55.11
Howard	58.14
Winneshiek	52.20
Region II	52.00
Cerro Gordo	48.36
Floyd	50.27
Franklin	56.83
Hancock	53.20
Kossuth	52.00
Mitchell	55.71
Winnebago	47.75
Worth	50.00
Region III	48.00
Buena Vista	46.50
Clay	43.18
Dickinson	51.00
Emmet	47.00
O'Brien	48.82
Osceola	55.67
Palo Alto	47.00
Region IV	58.00
Cherokee	52.50
Ida	61.50
Lyon	63.00
Monona	67.33
Plymouth	49.15
Sioux	55.50
Woodbury	54.44
Region V	52.00
Calhoun	49.75
Hamilton	51.73
Humboldt	52.86
Pocahontas	50.29
Webster	49.96
Wright	56.00
Region VI	49.00
Hardin	48.38
Marshall	47.96
Poweshiek	43.00
Tama	56.50
Region VII	51.00
Black Hawk	47.28
Bremer	50.17
Buchanan	48.40
Butler	58.20
Chickasaw	56.00
Fayette	57.56
Grundy	39.20
Region VIII	46.00
Delaware	41.17
Dubuque	48.82
Jackson	48.00
Region IX	49.00
Clinton	48.73
Muscatine	50.19
Scott	49.27
Region X	49.00
Benton	58.50
Cedar	45.86
Iowa	56.20
Johnson	41.90
Jones	46.11
Linn	48.04

Table 4. Mean Age of Dentists for Iowa by Region and County: 1968[a]

	Mean Age
Washington	47.50
Region XI	50.00
Boone	51.00
Dallas	53.55
Jasper	50.18
Madison	55.67
Marion	56.57
Polk	47.31
Story	47.52
Warren	39.00
Region XII	52.00
Audubon	49.50
Carroll	51.55
Crawford	47.00
Greene	54.00
Guthrie	53.00
Sac	59.57
Region XIII	49.60
Cass	50.60
Fremont	54.25
Harrison	62.00
Mills	41.00
Montgomery	54.00
Page	50.23
Pottawattamie	50.84
Shelby	34.20
Region XIV	51.80
Adair	50.67
Adams	36.50
Clarke	71.33
Decatur	49.00
Ringgold	61.67
Taylor	45.50
Union	48.00
Region XV	52.60
Appanoose	50.80
Davis	49.00
Jefferson	43.67
Keokuk	53.40
Lucas	54.00
Mahaska	59.73
Monroe	59.75
Van Buren	63.33
Wapello	51.44
Wayne	42.00
Region XVI	47.60
Des Moines	50.12
Henry	45.60
Lee	52.86
Louisa	56.00
State	49.49

[a] Data provided by the State Department of Health, Dental Health Division, Des Moines, Iowa.

Table 5. Age Distribution of Dentists for Iowa By Metropolitan and Non-Metropolitan County Groups: 1965[a]

	Metropolitan County Group			Non-Metropolitan County Group		
Age	Number of Dentists	Percent of Dentists	Cumulative Percent	Number of Dentists	Percent of Dentists	Cumulative Percent
-29	16	3	3	30	4	4
30-34	62	12	15	89	11	15
35-39	59	12	27	87	11	26
40-44	83	16	43	87	11	37
45-49	45	9	52	81	10	47
50-54	37	7	59	63	8	55
55-59	36	7	66	70	9	64
60-64	43	9	75	98	13	77
65-69	58	12	87	74	10	87
70-74	35	7	94	46	6	93
75-	28	6	100	57	7	100
Total	502 [b]	100	...	782 [c]	100	...

[a] Jerald L. Brown, *"A Distribution Model of Iowa Dentists,"* (unpublished M.A. Thesis, The University of Iowa, Iowa City, Iowa, 1969) p. 30.

[b] Represents 96.4% of the 521 metropolitan dentists in Iowa.

[c] Represents 95.9% of the 819 non-metropolitan dentists in Iowa.

Table 6. Age Distribution of Dentists for Iowa in 1965 and the United States in 1963[a]

	Iowa			United States		
Age	Number of Dentists	Percent of Dentists	Cumulative Percent	Number of Dentists	Percent of Dentists	Cumulative Percent
-29	46	4	4	...	9.9	9.9
30-34	151	12	16	...	11.3	21.2
35-39	146	11	27	...	15.1	36.3
40-44	170	13	40	...	11.3	47.6
45-49	126	10	50	...	8.8	56.4
50-54	100	8	58	...	8.9	65.3
55-59	106	8	66	...	9.5	74.8
60-64	141	11	77	...	8.9	83.7
65-69	132	20	87	...	7.4	91.1
70-74	81	6	93	...	4.1	95.2
75-	85	7	100	...	4.8	100.0
Total	1284 [b]	100	...	...	100.0	...

[a] Jerald L. Brown, *"A Distribution Model of Iowa Dentists,"* (unpublished M.A. Thesis, The University of Iowa, Iowa City, Iowa, 1969) pp. 27-28.

[b] Represents 95.8% of the 1,340 dentists in Iowa.

Table 7: Age Distribution of Dentists for Iowa: 1965 and 1968[a]

Age	Number of Dentists	Percent of Dentists	Cumulative Percent	Number of Dentists	Percent of Dentists	Cumulative Percent
-29	46	4	4	141	10	10
30-34	151	12	16	158	11	21
35-39	146	11	27	178	12	33
40-44	170	13	40	163	11	44
45-49	126	10	50	166	11	55
50-54	100	8	58	113	8	63
55-59	106	8	66	97	7	70
60-64	141	11	77	126	8	78
65-69	132	10	87	133	9	87
70-74	81	6	93	109	7	94
75-	85	7	100	85	6	100
Total	1,284	100	...	1,499	100	...

[a] Data for 1965 taken from Jerald L. Brown, *"A Distribution Model of Iowa Dentists,"* (unpublished M.A. Thesis, The University of Iowa, Iowa City, Iowa, 1969); and data for 1968 were provided by the Dental Health Division of the Iowa State Department of Health, Des Moines, Iowa.

APPENDIX E

Table 1. Population per Licensed Podiatrist for Selected Years: Iowa and United States

Iowa	1950	1964	1965	1967	1968	1969
Podiatrists	--	96[a]	--	--	103[b]	101[c]
Population	--	2,763,000[d]	--	--	2,752,000[e]	2,752,000[e]
Population per Licensed Podiatrist	--	28,781	--	--	26,718	27,247
United States						
Podiatrists[b]	6,400	8,008	7,600	8,000	8,506	--
Population[d]	152,271,000	191,372,000	193,815,000	197,863,000	199,861,000	--
Population per Licensed Podiatrist	23,792	23,898	25,502	24,733	23,496	--

[a] National Center for Health Statistics, *Health Resources Statistics, 1965*, Public Health Service, Washington, D.C.

[b] National Center for Health Statistics, *Health Resources Statistics, 1968*, Public Health Service, Washington, D.C.

[c] Data provided by the Iowa Podiatry Society, Des Moines, Iowa.

[d] U.S. Bureau of Census, *Statistical Abstract of the United States, 1969*, Washington, D.C.

[e] Estimates of Iowa's population for 1967. Provided by the Record and Statistics Division of the Iowa State Department of Health.

Table 2. Population per Resident Licensed Podiatrist in Iowa: 1969

	Podiatrists[a]	Population[b]	Population per Resident Licensed Podiatrist
Region I	1	69,540	69,540
Allamakee	0	15,960	
Clayton	0	21,490	
Howard	0	12,440	
Winneshiek	1	19,650	19,650
Region II	5	156,960	31,392
Cerro Gordo	3	48,570	16,190
Floyd	0	20,860	
Franklin	1	13,730	13,730
Hancock	0	13,910	
Kossuth	0	24,550	
Mitchell	0	13,680	
Winnebago	1	12,690	12,690
Worth	0	8,970	
Region III	3	107,970	35,990
Buena Vista	1	20,640	20,640
Clay	1	17,990	17,990
Dickinson	0	12,820	
Emmet	1	14,280	14,280
O'Brien	0	18,990	
Osceola	0	8,970	
Palo Alto	0	14,280	
Region IV	7	210,450	30,064
Cherokee	1	17,690	17,690
Ida	0	9,410	
Lyon	0	14,020	
Monona	0	13,040	
Plymouth	0	24,220	
Sioux	0	26,420	
Woodbury	6	105,620	17,603
Region V	5	128,960	25,792
Calhoun	0	15,880	
Hamilton	1	19,950	19,950
Humboldt	0	12,990	
Pocahontas	0	13,480	
Webster	4	47,860	11,965
Wright	0	18,800	
Region VI	4	97,840	24,460
Hardin	1	21,660	21,660
Marshall	2	37,650	18,825
Poweshiek	1	18,140	18,140
Tama	0	20,390	
Region VII	11	240,640	21,876
Black Hawk	10	125,360	12,536
Bremer	0	20,940	
Buchanan	0	20,450	
Butler	0	16,290	
Chickasaw	0	14,450	
Fayette	1	29,120	29,120
Grundy	0	14,030	
Region VIII	7	126,040	18,006
Delaware	1	17,030	17,030
Dubuque	6	88,120	14,687
Jackson	0	20,890	
Region IX	10	216,960	21,696
Clinton	2	56,270	28,135
Muscatine	1	34,680	34,680
Scott	7	126,010	18,001
Region X	12	301,230	25,103
Benton	0	22,510	
Cedar	0	18,050	
Iowa	0	16,590	
Johnson	2	59,310	29,655
Jones	0	20,060	
Linn	10	145,720	14,572
Washington	0	18,990	

	Podiatrists[a]	Population[b]	Population per Resident Licensed Podiatrist
Region XI	18	470,950	26,164
Boone	1	25,620	25,620
Dallas	1	23,360	23,360
Jasper	2	34,730	17,365
Madison	0	11,970	
Marion	1	26,170	26,170
Polk	13	272,810	20,985
Story	0	54,580	
Warren	0	26,170	
Region XII	1	96,380	96,380
Audubon	0	10,020	
Carroll	1	34,300	34,300
Crawford	0	19,540	
Greene	0	13,290	
Guthrie	0	12,990	
Sac	0	16,240	
Region XIII	5	188,590	37,718
Cass	1	18,080	18,080
Fremont	0	9,880	
Harrison	0	16,840	
Mills	0	11,370	
Montgomery	0	13,070	
Page	2	19,040	9,520
Pottawattamie	2	84,510	42,225
Shelby	0	15,800	
Region XIV	1	60,600	60,600
Adair	0	9,330	
Adams	0	6,360	
Clarke	0	7,620	
Decatur	0	7,380	
Ringgold	0	7,150	
Taylor	0	9,470	
Union	1	13,290	13,290
Region XV	6	158,040	26,340
Appanoose	0	15,270	
Davis	0	8,780	
Jefferson	1	14,890	14,890
Keokuk	0	15,250	
Lucas	1	10,130	10,130
Mahaska	1	21,600	21,600
Monroe	0	9,410	
Van Buren	0	9,380	
Wapello	3	44,610	14,870
Wayne	0	8,720	
Region XVI	5	120,850	24,170
Des Moines	3	47,720	15,907
Henry	0	17,590	
Lee	2	44,860	22,430
Louisa	0	10,680	
State Totals	101	2,752,000	27,248

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[a] Unpublished data from Iowa Podiatry Society, Des Moines, Iowa.

[b] Population estimates are for 1967—from Records & Statistics Division, Iowa Department of Health.

APPENDIX F

Table 1. Geographic Distribution of Optometrists in Iowa and Population/Optometrist Ratios by County and Regions: 1968

	Population[a]	IOA Members[b]	Population/IOA Member Ratios	Licensed Optomertrists[c]	Population/ Licensed Optometrists Ratios
Region I	69,540	5	13,908	8	8,693
Allamakee	15,960	1	15,960	1	15,960
Clayton	21,490	1	21,490	1	21,490
Howard	12,440	1	12,440	2	6,220
Winneshiek	19,650	2	9,825	4	4,913
Region II	156,960	21	7,474	20	7,848
Cerro Gordo	48,570	7	6,939	6	8,095
Floyd	20,860	3	6,953	4	5,215
Franklin	13,730	2	6,865	2	6,865
Hancock	13,910	1	13,910	1	13,910
Kossuth	24,550	4	6,138	3	8,183
Mitchell	13,680	1	13,680	1	13,680
Winnebago	12,690	2	6,345	2	6,345
Worth	8,970	1	8,970	1	8,970
Region III	107,970	20	5,399	24	4,499
Buena Vista	20,640	4	5,160	6	3,440
Clay	17,990	6	2,998	5	3,598

	Population[a]	IOA Members[b]	Population/IOA Member Ratios	Licensed Optomertrists	Population/ Licensed Optometrists Ratios
Dickinson	12,820	2	6,410	2	6,410
Emmet	14,280	4	3,570	5	2,856
O'Brien	18,990	2	9,495	3	6,330
Osceola	8,970	0		1	8,970
Palo Alte	14,280	2	7,140	2	7,140
Region IV	210,450	21	10,021	30	7,015
Cherokee	17,690	3	5,897	3	5,897
Ida	9,410	0		1	9,419
Lyon	14,020	1	14,020	2	7,010
Region IV, cont.					
Monona	13,040	2	6,520	2	6,520
Plymouth	24,220	4	6,055	4	6,055
Sioux	26,420	4	6,605	6	4,403
Woodbury	105,650	7	15,093	12	8,804
Region V	128,960	19	6,787	24	5,373
Calhoun	15,880	2	7,940	2	7,940
Hamilton	19,950	4	4,988	4	4,988
Humboldt	12,990	2	6,495	2	6,495
Pocahontas	13,480	2	6,740	2	6,740
Webster	47,860	4	11,965	9	5,318
Wright	18,800	5	3,760	5	3,760
Region VI	97,840	18	5,436	20	4,892
Hardin	21,660	3	7,220	3	7,220
Marshall	37,650	9	4,183	11	3,423
Poweshiek	18,140	3	6,047	3	6,047
Tama	20,390	3	6,797	3	6,797
Region VII	240,640	20	12,032	29	8,298
Black Hawk	125,360	9	13,929	16	7,835
Bremer	20,940	2	10,470	2	10,470
Buchanan	20,450	1	20,450	3	6,817
Butler	16,290	1	16,290	1	16,290
Chickasaw	14,450	1	14,450	1	14,450
Fayette	29,120	5	5,824	5	5,824
Grundy	14,030	1	14,030	1	14,030
Region VIII	126,040	9	14,004	10	12,604
Delaware	17,030	2	8,515	2	8,515
Dubuque	88,120	5	17,624	5	17,624
Jackson	20,890	2	10,445	3	10,445
Region IX	216,960	14	15,497	27	8,036
Clinton	56,270	4	14,068	9	6,252
Muscatine	34,680	2	17,340	3	11,560
Scott	126,010	8	15,751	15	8,401
Scott	126,010	8	15,751	15	8,401
Region X	301,230	22	13,692	37	8,141
Benton	22,510	3	7,503	3	7,503
Cedar	18,050	1	18,050	1	18,050
Iowa	16,590	0		1	16,590
Johnson	59,310	3	19,770	5	11,862
Jones	20,060	2	10,030	3	6,687
Linn	145,720	10	14,572	20	7,286
Washington	18,990	3	6,330	4	4,748
Region XI	475,410	32	14,717	51	9,234
Boone	25,620	2	12,810	4	6,405
Dallas	23,360	2	11,680	2	11,680
Jasper	34,730	3	11,577	3	11,577
Madison	11,970	1	11,970	1	11,970
Marion	26,170	2	13,085	4	6,543
Polk	272,810	14	19,486	30	9,094
Story	54,580	5	10,916	4	13,645
Warren	26,170	3	8,723	3	8,723

	Population	IOA Members[b]	Population/IOA Member Ratios	Licensed Optomertrists[c]	Population/ Licensed Optometrists Ratios
Region XII	96,380	9	10,709	18	5,354
Audubon	10,020	0		1	10,020
Carroll	24,300	3	8,100	5	4,860
Crawford	19,540	2	9,770	4	4,885
Greene	13,290	1	13,290	3	4,430
Guthrie	12,990	2	6,495	3	4,330
Sac	16,240	1	16,240	2	8,120
Region XIII	188,590	16	11,787	24	7,858
Cass	18,080	3	6,027	3	6,027
Fremont	9,880	0		0	
Harrison	16,840	2	8,420	2	8,420
Mills	11,370	1	11,370	2	5,685
Montgomery	13,070	2	6,535	3	4,357
Page	19,040	4	4,760	5	3,808
Pottawattamie	84,510	3	28,170	6	14,085
Shelby	15,800	1	15,800	3	5,267
Region XIV	60,600	9	6,733	10	6,060
Adair	9,330	1	9,330	1	9,330
Adams	6,360	1	6,360	1	6,360
Clarke	7,620	1	7,620	1	7,620
Decatur	7,380	1	7,380	1	7,380
Ringgold	7,150	1	7,150	0	
Taylor	9,470	1	9,470	2	4,735
Union	13,290	3	4,430	4	3,323
Region XV	158,040	17	9,296	22	7,184
Appanoose	15,270	2	7,635	3	5,090
Davis	8,780	1	8,780	1	8,780
Jefferson	14,890	4	3,723	5	2,978
Keokuk	15,250	1	15,250	1	15,250
Lucas	10,130	2	5,065	2	5,065
Mahaska	21,600	3	7,200	3	7,200
Monroe	9,410	1	9,410	1	9,410
Van Buren	9,380	0		0	
Wapello	44,610	3	14,870	6	7,435
Wayne	8,720	0		0	
Region XVI	120,850	11	10,986	17	7,109
Des Moines	47,720	5	9,544	6	7,953
Henry	17,590	3	5,863	4	4,398
Lee	44,860	3	14,953	7	6,409
Louisa	10,680	0		0	
State Totals	2,752,000	263	10,464	371	7,418

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[a] 1967 population estimates of the Records and Statistics Division of the Iowa State Department of Health, taken from "A Profile of Iowa Dentists – 1968", by John E. Goodrich, Director, Dental Health Division, Iowa State Department of Health, Des Moines, Iowa.

[b] *Iowa Optometrist*, Vol. XXII, No. 12, (December 1968), pp. 8-11. Members of the Iowa Optometric Association with Iowa addresses are included. Virtually all members are licensed practicing optometrists.

[c] *The Blue Book of Optometrists*, Chicago, Professional Press, Inc., 1968.

APPENDIX G

Table 1. Population per Resident Pharmacist Ratios, United States: 1961, 1964-1968

Year	Total Resident Active Pharmacists	Total Community Active Pharmacists	Total Resident Population (x1000)[a]	Population/ Active Pharmacists	Population/ Community Pharmacists
1961	117,094 [b]	104,092 [c]	183,057	1563	1759
1964	118,284 [d]	104,400 [e]	193,815	1618	1833

	Total Resident Active Pharmacists	Total Community Active Pharmacists	Total Resident Population (x1000)[a]	Population/ Active Pharmacists	Population/ Community Pharmacists
1965	121,093[f]	104,693[g]	193,815	1601	1851
1966	122,421[h]	92,372[i]	195,936	1601	2121
1967	121,529[j]	102,708[k]	197,863	1628	1926
1968	124,486[l]	105,203	199,549	1603	1897

[a] U.S. Bureau of the Census, *Statistical Abstract of the United States: 1968* (89th Edition), Washington, D.C., 1968, p. 5.
[b] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, Illinois, p. 67.
[c] *Ibid.*, p. 68.
[d] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, Illinois, p. 69.
[e] *Ibid.*, p. 71.
[f] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, Illinois, p. 158.
[g] *Ibid.*, p. 163.
[h] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, Illinois, p. 237.
[i] *Ibid.*, p. 242.
[j] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, Illinois, p. 131.
[k] *Ibid.*, p. 136.
[l] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago, Illinois.

Table 2. Population Per Resident Pharmacist Ratios, Iowa: 1961, 1964-1968

Year	Total Resident Active Pharmacists	Total Community Active Pharmacists	Total Resident Population[a]	Population/ Active Pharmacists	Population/ Community Pharmacists
1961	1,552[c]	1,365[d]	2,759,000	1778	2021
1964	1,331[e]	1,171[f]	2,763,000	2076	2360
1965	1,379[g]	1,218[h]	2,761,000	2002	2267
1966	1,621[i]	1,375[j]	2,760,000	1703	2075
1967	1,653[k]	1,330[l]	2,753,000	1665	2070
1968	1,787[m]	1,513	2,753,000[b]	1541	1820

[a] U.S. Bureau of the Census, *Statistical Abstract of the United States: 1968* (89th Edition), Washington, D.C., 1968, p. 12.
[b] 1967 Population.
[c] National Association of Boards of Pharmacy, *1962 Proceedings*, Chicago, Illinois, p. 66.
[d] *Ibid.*, p. 68.
[e] National Association of Boards of Pharmacy, *1965 Proceedings*, Chicago, Illinois, p. 69.
[f] *Ibid.*, p. 75.
[g] National Association of Boards of Pharmacy, *1966 Proceedings*, Chicago, Illinois, p. 161.
[h] *Ibid.*, p. 163.
[i] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, Illinois, p. 237.
[j] *Ibid.*, p. 242.
[k] National Association of Boards of Pharmacy, *1968 Proceedings*, Chicago, Illinois, p. 131.
[l] National Association of Boards of Pharmacy, *1967 Proceedings*, Chicago, Illinois, p. 242.
[m] National Association of Boards of Pharmacy, *1969 Proceedings*, Chicago, Illinois.

Table 3. Population per Full-Time Licensed Community Pharmacist Resident in Iowa, by County: 1966

County	Number of Full-Time Community Pharmacists[a]	Population[b]	Population Per Full-Time Licensed Community Pharmacist
Region I	23	69,540	3,023
Allamakee	5	15,960	3,192
Clayton	6	21,490	3,582
Howard	6	12,440	2,073
Winneshiek	6	19,650	3,275
Region II	57	156,960	2,757
Cerro Gordo	26	48,570	1,868
Floyd	5	20,860	4,172
Franklin	3	13,730	4,577
Hancock	5	13,910	2,782
Kossuth	8	24,550	3,069
Mitchell	2	13,680	6,840
Winnebago	6	12,690	2,115
Worth	2	8,970	4,485
Region III	54	107,970	1,999
Buena Vista	10	20,640	2,064
Clay	9	17,990	1,999
Dickinson	6	12,820	2,137
Emmet	10	14,280	1,428
Palo Alto	6	14,280	2,360
O'Brien	9	8,970	2,110
Osceola	4	18,990	2,243
Region IV	96	210,450	2,192
Cherokee	7	17,690	2,527
Ida	4	9,410	2,353
Lyon	5	14,020	2,804
Monona	9	13,040	1,449
Plymouth	9	24,220	2,691
Sioux	11	26,420	2,402
Woodbury	51	105,650	2,073
Region V	55	128,960	2,345

County	Number of Full-Time Community Pharmacists[a]	Population[b]	Population Per Full-Time Licensed Commmunity Pharmacist
Calhoun	4	15,880	3,970
Hamilton	12	19,950	1,663
Humboldt	4	12,990	3,248
Pocahontas	4	13,480	3,370
Webster	24	47,860	1,994
Wright	7	18,800	2,686
Region VI	41	97,840	2,386
Hardin	12	21,660	1,805
Marshall	16	37,650	2,353
Poweshiek	10	18,140	1,814
Tama	3	20,390	6,797
Region VII	94	240,640	2,560
Black Hawk	58	125,360	2,161
Bremer	7	20,940	2,991
Buchanan	5	20,450	4,090
Butler	3	16,290	5,430
Chickasaw	4	14,450	3,613
Fayette	11	29,120	2,647
Grundy	6	14,030	2,328
Region VIII	48	126,040	2,626
Delaware	5	17,030	2,406
Dubuque	34	88,120	2,592
Jackson	9	20,890	2,321
Region IX	99	216,960	2,192
Clinton	18	56,270	3,126
Muscatine	14	34,680	2,477
Scott	67	126,010	1,881
Region X	109	301,230	2,764
Benton	7	22,510	
Cedar	3	18,050	6,017
Iowa	7	16,590	2,370
Johnson	19	59,310	3,122
Jones	8	20,060	2,507
Linn	56	145,720	2,602
Washington	9	18,990	2,110
Region XI	258	470,950	1,825
Boone	17	25,620	1,507
Dallas	12	23,360	1,780
Jasper	16	34,730	2,171
Madison	6	11,970	1,995
Marion	10	26,170	2,617
Polk	161	272,810	1,698
Story	31	54,580	1,761
Warren	5	27,710	4,342
Region XII	31	96,380	3,109
Audubon	4	10,020	2,505
Carroll	7	24,300	3,471
Crawford	6	19,540	3,257
Greene	5	13,290	2,658
Guthrie	4	12,990	3,248
Sac	5	16,240	3,248
Region XIII	99	188,590	1,905
Cass	13	18,080	1,398
Fremont	4	9,880	2,470
Harrison	11	16,840	1,531
Mills	3	11,370	3,790
Montgomery	7	13,070	1,867
Page	15	19,040	1,289
Pottawattamie	42	84,510	2,012
Shelby	4	15,800	3,950
Region XIV	27	60,600	2,244
Adair	4	9,330	2,333
Adams	2	6,360	3,180
Clarke	2	7,620	3,810
Decatur	4	7,380	1,845
Ringgold	3	7,150	2,383
Taylor	3	9,470	3,157
Union	9	13,290	1,477
Region XV	57	158,040	2,773
Appanoose	6	15,270	2,545
Davis	1	8,780	8,780
Jefferson	8	14,890	1,861
Keokuk	5	15,250	3,050
Lucas	2	10,130	5,065
Mahaska	8	21,600	2,700
Monroe	3	9,410	3,137
Van Buren	1	9,380	9,380
Wapello	21	44,610	2,124
Wayne	2	8,720	4,360
Region XVI	56	120,850	2,158
Des Moines	26	47,720	1,835
Henry	7	17,590	2,513
Lee	19	44,860	2,361
Louisa	4	10,680	2,670
State Total	1,204	2,752,000	2,286

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[a] Count of Pharmacists includes only those licensed, resident community pharmacists active full-time in Iowa in 1966. Comes from "Pharmacy Manpower Study," Iowa Pharmaceutical Association.

[b] 1967 Population figures come from Records and Statistics Division, Iowa Department of Health.

APPENDIX H

Table 1. Population per Dietitian Ratios for Iowa by County and Region: 1969

	Pop.	Iowa Diet. Assoc. Mbrs.[a]	Pop. per IDA Mbrs.[b]
Region I	69,540	5	13,908
Allamakee	15,960	1	15,960
Clayton	21,490	3	7,163
Howard	12,440	0	
Winneshiek	19,650	1	19,650
Region II	156,960	10	15,696
Cerro Gordo	48,570	5	9,714
Floyd	20,860	2	10,430
Franklin	13,730	0	
Hancock	13,910	0	
Kossuth	24,550	1	24,550
Mitchell	13,680	1	13,680
Winnebago	12,690	1	12,690
Worth	8,970	0	
Region III	107,970	4	26,993
Buena Vista	20,640	1	20,640
Clay	17,990	0	
Dickinson	12,820	1	12,820
Emmet	14,280	0	
O'Brien	18,990	1	18,990
Osceola	8,970	0	
Palo Alto	14,280	1	14,280
Region IV	210,450	10	21,045
Cherokee	17,690	2	8,845
Ida	9,410	0	
Lyon	14,020	0	
Monona	13,040	0	
Plymouth	24,220	2	12,110
Sioux	26,420	0	
Woodbury	105,650	6	17,608
Region V	128,960	6	21,493
Calhoun	15,880	1	15,880
Hamilton	19,950	1	19,950
Humboldt	12,990	1	12,990
Pocahontas	13,480	0	
Webster	47,860	3	15,953
Wright	18,880	0	
Region VI	97,840	10	9,784
Hardin	21,660	3	7,220
Marshall	37,650	2	18,825
Poweshiek	18,140	3	6,047
Tama	20,390	2	10,195
Region VII	240,640	13	18,511
Black Hawk	125,360	9	13,929
Bremer	20,940	2	10,470
Buchanan	20,450	0	
Butler	16,290	1	16,290
Chickasaw	14,450	0	
Fayette	29,120	1	29,120
Grundy	14,030	0	
Region VIII	126,040	9	14,004
Delaware	17,030	1	17,030
Dubuque	88,120	7	12,589
Jackson	20,890	1	20,890
Region IX	216,960	20	10,848
Clinton	56,270	4	14,068
Muscatine	34,680	0	
Scott	126,010	16	7,876
Region X	310,230	85	3,650
Benton	22,510	2	11,255
Cedar	18,050	2	9,025
Iowa	16,590	0	
Johnson	59,310	63	941
Jones	20,060	2	10,030
Linn	145,720	15	9,715
Washington	18,990	1	18,990
Region XI	470,950	113	4,168
Boone	25,620	3	8,540
Dallas	23,360	4	5,840
Jasper	34,730	4	8,683
Madison	11,970	1	11,970
Marion	26,170	4	6,543
Polk	272,810	45	6,062
Story	54,580	51	1,070
Warren	21,710	1	21,710
Region XII	96,380	3	32,127
Audubon	10,020	0	
Carroll	24,300	1	24,300
Crawford	19,540	0	
Greene	13,290	2	6,645
Guthrie	12,990	0	
Sac	16,240	0	
Region XIII	188,590	12	15,716
Cass	18,080	0	
Fremont	9,880	1	9,880
Harrison	16,840	1	16,840
Mills	11,370	2	5,685
Montgomery	13,070	0	
Page	19,040	2	9,520
Pottawattamie	84,510	6	14,085
Shelby	15,800	0	
Region XIV	60,600	2	30,300
Adair	9,330	0	
Adams	6,360	0	
Clarke	7,620	0	
Decatur	7,380	2	3,690
Ringgold	7,150	0	
Taylor	9,470	0	
Union	13,290	0	
Region XV	158,040	10	15,804
Appanoose	15,270	1	15,270
Davis	8,780	0	
Jefferson	14,890	1	14,890
Keokuk	15,250	0	
Lucas	10,130	0	
Mahaska	21,600	0	
Monroe	9,410	0	
Van Buren	9,380	0	
Wapello	44,610	8	5,576
Wayne	8,720	0	
Region XVI	120,850	12	10,071
Des Moines	47,720	4	11,930
Henry	17,590	6	2,932
Lee	44,860	2	22,430
Louisa	10,680	0	
State Totals	2,752,000	324	8,494

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[a] 1967 figures of the Records and Statistics Division, Iowa State Department of Health, Des Moines, Iowa.

[b] Iowa Dietetic Association. Members who reside in Iowa are included in the figures taken from the membership roster, revised May, 1969.

APPENDIX I

Table 1. Population per Occupational Therapist Ratios in Iowa by County and Region: 1969

	Population[a]	Employed Registered Occupational Therapists[b]	Population per Employed Registered Occupational Therapist	Registered Occupational Therapists[c]	Population per Registered Occupational Therapist
Region I[d]	69,540	0		1	
Winneshiek	19,650	0		1	19,650
Region II	156,960	2	78,480	4	39,240
Cerro Gordo	48,570	2	24,285	3	16.190
Mitchell	13,680	0		1	13,680
Region III	107,970	0		0	
Region IV	210,450	2	105,225	4	52,613
Cherokee	17,690	1	17,690	1	17,690
Woodbury	105,650	1	105,650	3	35,217
Region V	128,960	0		0	
Region VI	97,840	1	97,840	1	97,840
Marshall	37,650	1	37,650	1	37,650
Region VII	240,640	5	48,128	4	60,160
Blawk Hawk	125,360	3	41,787	3	41,787
Buchanan	20,450	2	10,225	1	20,450
Region VIII	126,040	3	42,013	3	42,013
Dubuque	88,120	2	44,060	2	44,060
Jackson	20,890	1	20,890	1	20,890
Region IX	216,960	2	108,480	10	21,696
Clinton	56,270	0		1	56,270
Muscatine	34,680	0		1	34,680
Scott	126,010	2	63,005	8	15,751
Region X	301,230	26	11,586	40	7,531
Johnson	59,310	16	3,707	25	2,372
Linn	145,720	10	14,572	14	10,409
Washington	18,990	0		1	18,990
Region XI	470,950	12	39,246	17	27,703
Jasper	34,730	0		1	34,730
Marion	26,170	1	26,170	1	26,170
Polk	272,810	8	34,101	12	22,734
Story	54,580	3	18,193	3	18,193
Region XII	96,380	0		0	
Region XIII	188,590	0		0	
Region XIV	60,600	0		0	
Region XV	158,040	1	158,040	4	39,510
Jefferson	14,890	0		1	14,890
Keokuk	15,250	0		1	15,250
Monroe	9,410	1	9,410	1	9,410
Wapello	44,610	0		1	44,610
Region XVI	120,850	2	60,425	5	24,170
Des Moines	47,720	2	23,860	3	15,907
Henry	17,590	0		1	17,590
Lee	44,860	0		1	44,860
State Totals	2,752,000	56	49,143	93	29.591

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[a] Records and Statistics Division, Iowa State Department of Health, Des Moines, Iowa. (1967 estimates).

[b] Iowa Occupational Therapy Association. The figures include employed registered occupational therapists (OTR's) who are Association members and employed OTR's who are not Association members. The data are given according to location of employment.

[c] Iowa Occupational Therapy Association. The data include OTR's in Iowa and are given according to place of residence. Retired OTR's are excluded from these figures.

[d] Those counties reporting no registered occupational therapists in either category are not listed.

APPENDIX J

Table 1. Population/Practicing APTA[a] Member Ratios for the United States and Iowa: 1960-1970[b]

Year	United States	Iowa
1960	29,997[c]	n.a.[d]
1965	24,874	24,919
1967	24,251	21,827
1969	n.a.[d]	20,385[e]
1970	--	18,849[f]

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[a] American Physical Therapy Association.

[b] National Center for Health Statistics, *Health Resources Statistics, 1965*, and *1968*, Public Health Service, Washington, D.C. Population figures are from the U.S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, D.C.

[c] Estimated from data given in National Center for Health Statistics, *Health Resources Statistics, 1965*, Public Health Service, Washington, D.C.

[d] Not available.

[e] This figure is the population/practicing licensed physical therapist ratio. The data used include practicing members of the APTA and a few licensed practicing therapists who are not eligible for APTA membership.

[f] See Table 2, Appendix J.

Table 3. Iowa APTA Membership, Employment Status: October, 1969[a]

	Total Mbrs.	% of Total Practicing
Salaried by hospitals	79	64.8
Self-employed	27	22.1
Other (Schools, Clinics, etc.)	5	4.1
Subtotal (direct patient care)	111	91.0
Education	6	4.9
Administration	5	4.1
Subtotal	11	9.0
Practicing Members	122	100.0
Retired or Non-practicing Members	44	

	Ttl.	% of Total Mbrshp.
Practicing Members	122	73.5
Non-practicing Members	44	26.5
Total Membership	166	100.0

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[a] Iowa Chapter, American Physical Therapy Association, October, 1969. (The data do not include five licensed practicing therapists who are not eligible for APTA memberships.)

Table 2. Geographical Distribution of Physical Therapists Residing in Iowa and Population/Physical Therapist Ratios by County and Region: 1970

	Population[a]	Physical Therapists by Home Address[b]	Population per Physical Therapist	Practicing Physical Therapists by Business Address[c]	Population per Practicing Physical Therapist
Region I	69,540	1	69,540	1	69,540
Allamakee	15,960	0		0	
Clayton	21,490	0		0	
Howard	12,440	0		0	
Winneshiek	19,650	1	19,650	1	19,650
Region II	156,960	11	14,269	4	39,240
Cerro Gordo*	48,570	8	6,071	4	12,142
Floyd	20,860	0		0	
Franklin*	13,730	2	6,865	0	
Hancock*	13,910	1	13,910	0	
Kossuth	24,550	0		0	
Mitchell	13,680	0		0	
Winnebago	12,690	0		0	
Worth	8,970	0		0	
Region III	107,970	5	21,594	3	35,990
Buena Vista	20,640	2	10,320	2	10,320
Clay*	17,990	2	8,995	0	
Dickinson	12,820	0		0	
Emmet	14,280	0		1	14,280
Osceola	8,970	0		0	
O'Brien	18,990	1	18,990	0	
Palo Alto	14,280	0		0	

	Population[a]	Physical Therapists by Home Address[b]	Population per Physical Therapist	Practicing Physical Therapists by Business Address[c]	Population per Practicing Physical Therapist
Region IV	210,450	8	26,306	8	26,306
Cherokee	17,690	0		1	17,690
Ida	9,410	0		0	
Lyon	14,020	0		0	
Monona	13,040	0		0	
Plymouth	24,220	0		0	
Sioux	26,420	0		0	
Woodbury*	105,650	8	13,206	7	15,093
Region V	128,960	3	42,987	4	32,240
Calhoun	15,880	0		0	
Hamilton	19,950	0		0	
Humboldt	12,990	0		0	
Pocahontas	13,480	0		0	
Webster	47,860	3	15,953	4	11,965
Wright	18,800	0		0	
Region VI	97,840	5	19,568	4	24,460
Hardin*	21,660	1	21,660	0	
Marshall	37,650	3	12,550	3	12,550
Poweshiek	18,140	0		0	
Tama	20,390	1	20,390	1	20,390
Region VII	240,640	21	11,459	16	15,040
Black Hawk	125,360	19	6,598	14	8,954
Bremer	20,940	0		0	
Buchanan	20,450	1	20,450	0	
Butler	16,290	0		0	
Chickasaw	14,450	0		0	
Fayette	29,120	1	29,120	2	14,560
Grundy	14,030	0		0	
Region VIII	126,040	14	9,003	10	12,604
Delaware	17,030	1	17,030	1	17,030
Dubuque*	88,120	11	8,911	8	11,015
Jackson	20,890	2	10,445	1	20,890
Region IX	216,960	12	18,080	8	27,120
Clinton	56,270	3	18,757	5	11,254
Muscatine*	34,680	1	34,680	0	
Scott*	126,010	8	15,751	3	42,003
Region X	301,230	69	4,366	38	7,921
Benton	22,510	1	22,510	0	
Cedar	18,050	0		0	
Iowa	16,590	0		0	
Johnson*	59,310	50	1,186	28	2,118
Jones	20,060	1	20,060	0	
Linn*	145,720	17	8,545	9	16,191
Washington	18,990	0		1	18,990
Region XI	470,950	55	8,563	30	15,698
Boone	25,620	1	25,620	2	12,810
Dallas*	23,360	2	11,680	0	
Jasper*	34,730	3	11,577	2	17,365
Madison	11,970	0		0	
Marion*	26,170	4	6,543	1	26,170
Polk*	272,810	34	8,024	23	11,861
Story*	54,580	10	5,458	2	27,290
Warren*	26,170	1	26,170	0	
Region XII	96,380	1	96,380	1	96,380
Audubon	10,020	0		0	
Carroll	24,300	1	24,300	1	24,300
Crawford	19,540	0		0	
Greene	13,290	0		0	
Guthrie	12,990	0		0	
Sac	16,240	0		0	

	Population[a]	Physical Therapists by Home Address[b]	Population per Physical Therapist	Practicing Physical Therapists by Business Address[c]	Population per Practicing Physical Therapist
Region XIII	188,590	8	23,574	6	31,432
Cass*	18,080	1	18,080	0	
Fremont	9,880	0		0	
Harrison	16,840	0		0	
Mills	11,070	1	11,070	1	11,070
Montgomery	13,070	0		0	
Page	19,040	1	19,040	1	19,040
Pottawattamie	84,510	4	21,128	3	28,170
Shelby	15,800	1	15,800	1	15,800
Region XIV	60,600	1	60,600	0	
Adair	9,330	0		0	
Adams	6,360	0		0	
Clarke	7,620	0		0	
Decatur	7,380	0		0	
Ringgold	7,150	0		0	
Taylor	9,470	0		0	
Union*	13,290	1	13,290	0	
Region XV	158,040	6	26,340	4	39,510
Appanoose	15,270	0		0	
Davis	8,780	1	8,780	1	8,780
Jefferson	14,890	1	14,890	1	14,890
Keokuk	15,250	0		0	
Lucas	10,130	0		0	
Mahaska	21,600	0		0	
Monroe*	9,410	1	9,410	0	
Van Buren	9,380	0		0	
Wapello*	44,610	3	14,870	2	22,305
Wayne	8,720	0		0	
Region XVI	120,850	11	10,986	7	17,264
Des Moines*	47,720	3	15,907	3	15,907
Henry*	17,590	3	5,863	1	17,590
Lee	44,860	3	14,953	3	14,953
Louisa*	10,680	2	5,340	0	5,340
State Totals	2,752,000	231	11,913	144	19,097

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[a] 1967 population estimates of the Records and Statistics Division, Iowa State Department of Health, taken from *A Profile of Iowa Dentists – 1968,* Dental Health Division, Des Moines, Iowa.

[b] Data provided by the American Physical Therapy Association, Iowa Chapter. The geographic organization of the raw data was based on reported "home address" as of March 1970 for members of the Iowa Chapter of the APTA, and as of July 1969 for licensed Iowa physical therapists who were not members of the APTA, but residents of this state.

[c] Data provided by the American Physical Therapy Association, Iowa Chapter. The geographic organization of the raw data was based on reported "business address" as of March 1970 by members of the Iowa Chapter of the APTA. These data include full-time practicing APTA members plus six part-time employed APTA members. Non-APTA members, licensed to practice in Iowa, were excluded from these computations because their employment status was unknown. Therefore, the ratios of "asterisked counties" may be overestimated for this column only – on the assumption that some non-members may be practicing.

APPENDIX K

Table 1. Population per Registered X-ray Technologist (RT/ARRT) for Iowa: 1969

	Pop.[a]	No. Reg. Rad. Tech's[b]	Pop. per Reg. Tech.		Pop.[a]	No. Reg. Rad. Tech's[b]	Pop. per Reg. Tech.
Region I	69,540	7	9,934	Region II	156,960	55	2,854
Allamakee	15,960	3	5,320	Cerro Gordo	48,570	24	2,024
Clayton	21,490	3	7,163	Floyd	20,860	9	2,318
Howard	12,440	0		Franklin	13,730	2	6,865
Winneshiek	19,650	1	19,650	Hancock	13,910	3	4,637

	Pop.[a]	No. Reg. Rad. Tech's[b]	Pop. per Reg. Tech.
Kossuth	24,550	8	3,069
Mitchell	13,680	1	13,680
Winnebago	12,690	2	6,345
Worth	8,970	6	1,495
Region III	107,970	24	4.499
Buena Vista	20,640	5	4.128
Clay	17,990	4	4.498
Dickinson	12,820	2	6.410
Emmet	14,280	6	2,380
O'Brien	18,990	2	9.495
Osceola	8,970	1	8,970
Palo Alto	14,280	4	3,570
Region IV	210,450	95	2,215
Cherokee	17,690	9	1,966
Ida	9,410	4	2,353
Lyon	14,020	1	14,020
Monoma	13,040	5	2,608
Plymouth	24,220	4	6,055
Sioux	26,420	3	8,807
Woodbury	105,650	69	1,531
Region V	128,960	46	2,803
Calhoun	15,880	4	3,970
Hamilton	19,950	1	19,950
Humboldt	12,990	1	12,990
Pocahontas	13,480	3	4,493
Webster	47,860	32	1,496
Wright	18,880	5	3,760
Region VI	97,840	9	10,871
Hardin	21,660	3	7,220
Marshall	37,650	3	12,550
Poweshiek	18,140	1	18,140
Tama	20,390	2	10.195
Region VII	240,640	83	2,899
Black Hawk	125,360	56	2,239
Bremer	20,940	7	2,991
Buchanan	20,450	5	4,090
Butler	16,290	3	5,430
Chickasaw	14,450	1	14,450
Fayette	29,120	6	4,853
Grundy	14,030	5	2,806
Region VIII	126,040	79	1,595
Delaware	17,030	3	5,673
Dubuque	88,120	69	1,277
Jackson	20,890	7	2,984
Region IX	216,960	89	2,438
Clinton	56,270	24	2,345
Muscatine	34,680	6	5,760
Scott	126,010	59	2,136
Region X	310,230	159	1,951
Benton	22,510	4	5,628
Cedar	18,050	3	6,017
Iowa	16,590	7	2,370
Johnson	59,310	71	835
Jones	20,060	4	5,015
Linn	145,720	67	2,175
Washington	18,990	3	6.330
Region XI	470,950	153	3,078
Boone	25,620	9	2.847
Dallas	23,360	7	3.337
Jasper	34,730	4	8,683
Madison	11,970	2	5,985
Marion	26,170	4	6,543
Polk	272,810	100	2,728
Story	54,580	26	2,099
Warren	21,710	1	21,710
Region XII	96,380	24	4,016
Audubon	10,020	0	
Carroll	24,300	8	3,038
Crawford	19,540	7	2,791
Greene	13,290	6	2,215
Guthrie	12,990	2	6.495
Sac	16,240	1	16,240
Region XIII	188,590	62	3,042
Cass	18,080	4	4,520
Fremont	9,880	2	4,940
Harrison	16,840	4	4,210
Mills	11,370	1	11,370
Montgomery	13,070	1	13,070
Page	19,040	0	
Pottawattamie	84,510	43	1,965
Shelby	15,800	7	2,257
Region XIV	60,600	14	4,329
Adair	9,330	2	4,665
Adams	6,360	4	1,590
Clarke	7,620	0	
Decatur	7,380	0	
Ringgold	7,150	1	7,150
Taylor	9,470	1	9,470
Union	13,290	6	2,215
Region XV	158,040	47	3,363
Appanoose	15,270	4	3,818
Davis	8,780	6	1,463
Jefferson	14,890	6	2,482
Keokuk	15,250	0	
Lucas	10,130	0	
Mahaska	21,600	10	2,160
Monroe	9,410	0	
Van Buren	9,380	0	
Wapello	44,610	20	2,231
Wayne	8,720	1	8,720
Region XVI	120,850	42	2,877
Des Moines	47,720	15	3,181
Henry	17,590	5	3,518
Lee	44,860	20	2,243
Louisa	10,680	2	5,340
State Totals	2,752,000	988	2,785

Source: [a] 1967 figures of the Records and Statistics Division, State Department of Health, Des Moines, Iowa.
[b] *The American Registry of Radiologic Technologists*, September, 1969.

APPENDIX L

Table 1. Population per Speech/Hearing Clinician Ratio in Iowa by Region and County: 1969

	Population[a]	Number of Speech/Hearing Personnel[b]	Population per Speech/Hearing Clinician Ratios
Region I	69,540	4	17,385
Allamakee	15,960	0	
Clayton	21,490	2	10,745
Howard	12,440	1	12,440
Winneshiek	19,650	1	19,650
Region II	156,960	11	14,269
Cerro Gordo	48,570	6	8,095
Floyd	20,860	0	
Franklin	13,730	1	13,730
Hancock	13,910	1	13,910
Kossuth	24,550	1	24,550
Mitchell	13,680	0	
Winnebago	12,690	1	12,690
Worth	8,970	1	8,970
Region III	107,970	12	8,997
Buena Vista	20,640	5	4,128
Clay	17,990	2	8,995
Dickinson	12,820	2	6,410
Emmet	14,280	1	14,280
O'Brien	18,990	0	
Osceola	8,970	0	
Palo Alto	14,280	2	7,140
Region IV	210,450	27	7,794
Cherokee	17,690	1	17,690
Ida	9,410	1	9,410
Lyon	14,020	1	14,020
Monona	13,040	2	6,520
Plymouth	24,220	3	8,073
Sioux	26,420	6	4,403
Woodbury	105,650	13	8,127
Region V	128,960	14	9,211
Calhoun	15,880	2	7,940
Hamilton	19,950	3	6,650
Humboldt	12,990	4	3,247
Pocahontas	13,480	0	
Webster	47,860	4	11,965
Wright	18,800	1	18,800
Region VI	97,840	15	6,523
Hardin	21,660	2	10,830
Marshall	37,650	5	7,530
Poweshiek	18,140	3	6,047
Tama	20,390	5	4,078
Region VII	240,640	52	4,628
Black Hawk	125,360	42	2,985
Bremer	20,940	3	6,980
Buchanan	20,450	1	20,450
Butler	16,290	1	16,290
Chickasaw	14,450	1	14,450
Fayette	29,120	2	14,560
Grundy	14,030	2	7,015
Region VIII	126,040	11	11,458
Delaware	17,030	3	5,677
Dubuque	88,120	5	17,624
Jackson	20,890	3	6,963
Region IX	216,960	41	5,292
Clinton	56,270	5	11,254
Muscatine	34,680	9	3,853
Scott	126,010	27	4,667
Region X	310,230	94	3,300
Benton	22,510	1	22,510
Cedar	18,050	1	18,050
Iowa	16,590	1	16,590
Johnson	59,310	63	941
Jones	20,060	3	6,687
Linn	145,720	24	6,072
Washington	18,990	1	18,990
Region XI	470,950	61	7,720
Boone	25,620	2	12,810
Dallas	23,360	5	4,672
Jasper	34,730	4	8,682
Madison	11,970	1	11,970
Marion	26,170	2	13,085
Polk	272,810	37	7,373
Story	54,580	8	6,822
Warren	21,710	2	10,855
Region XII	96,380	10	9,638
Audubon	10,020	1	10,020
Carroll	24,300	4	6,075
Crawford	19,540	1	19,540
Greene	13,290	1	13,290
Guthrie	12,990	1	12,990
Sac	16,240	2	8,120
Region XIII	188,590	16	11,787
Cass	18,080	2	9,040
Fremont	9,880	0	
Harrison	16,840	0	
Mills	11,370	2	5,670
Montgomery	13,070	1	13,070
Page	19,040	1	19,040
Pottawattamie	84,510	9	9,390
Shelby	15,800	1	15,800
Region XIV	60,600	4	15,150
Adair	9,330	1	9,330
Adams	6,360	0	
Clarke	7,620	0	
Decatur	7,380	2	3,690
Ringgold	7,150	0	
Taylor	9,470	0	
Union	13,290	1	13,290
Region XV	158,040	16	9,877
Appanoose	15,270	2	7,635
Davis	8,780	1	8,780
Jefferson	14,890	2	7,445
Keokuk	15,250	1	15,250
Lucas	10,130	1	10,130
Mahaska	21,600	2	10,800
Monroe	9,410	0	
Van Buren	9,380	1	9,380
Wapello	44,610	5	8,922
Wayne	8,720	1	8,720

	Population	Number of Speech/Hearing Personnel	Population per Speech/Hearing Clinician Ratios
Region XVI	120,850	8	15,106
Des Moines	47,720	3	15,907
Henry	17,590	1	17,590
Lee	44,860	4	11,215
Louisa	10,680	0	
State Totals	2,752,000	396	6,949

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[a] 1967 Figures of the Records and Statistics Division, State Department of Health, Des Moines, Iowa.

[b] "Distribution of Speech and Hearing Personnel in Iowa," provided by the Iowa Speech and Hearing Association, May 1969. Some of these clinicians may not be employed.